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MANUAL OF DYEING

THE DYEING MANUFACTURER

1904

JOSEPH L. CUTLER COMPANY

NEW YORK

Published by the Company

1904

JOSEPH L. CUTLER COMPANY

Published by the Company

INDEX OF THE MARGINAL NUMBERS.

- ① General Directions for the Dyeing of Cotton Colours.
- ② Dyeing of Loose Cotton, and Yarn, including Mercerised Cotton Yarn.
- ③ Machine-Dyeing.
- ④ Warp Dyeing.
- ⑤ Dyeing of Knit Goods.
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- ⑦ Dyeing of China-Cloth and other available materials.
- ⑧ Appendix: Chemicals, Thermometer and other Tables, Weights and Measures.
Index.
Percentage Tables.

A MANUAL OF DYEING

WITH THE DYESTUFFS

OF THE

CASSELLA COLOR COMPANY

NEW YORK

182 AND 184, FRONT STREET

VOL. I.

COTTON AND ALLIED FIBRES

SECOND (ENLARGED) EDITION

1911.

PUBLISHED BY THE CASSELLA COLOR COMPANY,
NEW YORK.



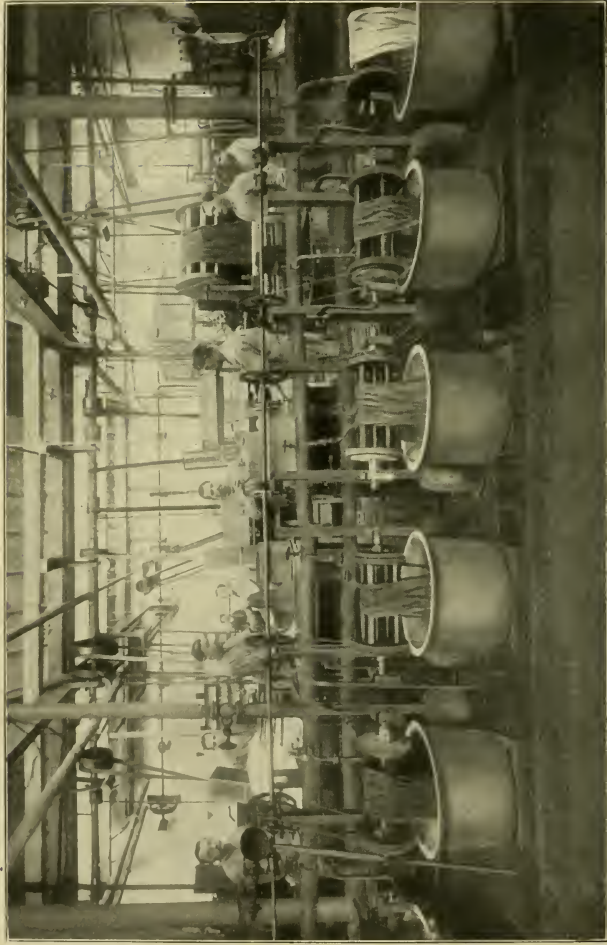
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Experimental Dye-House

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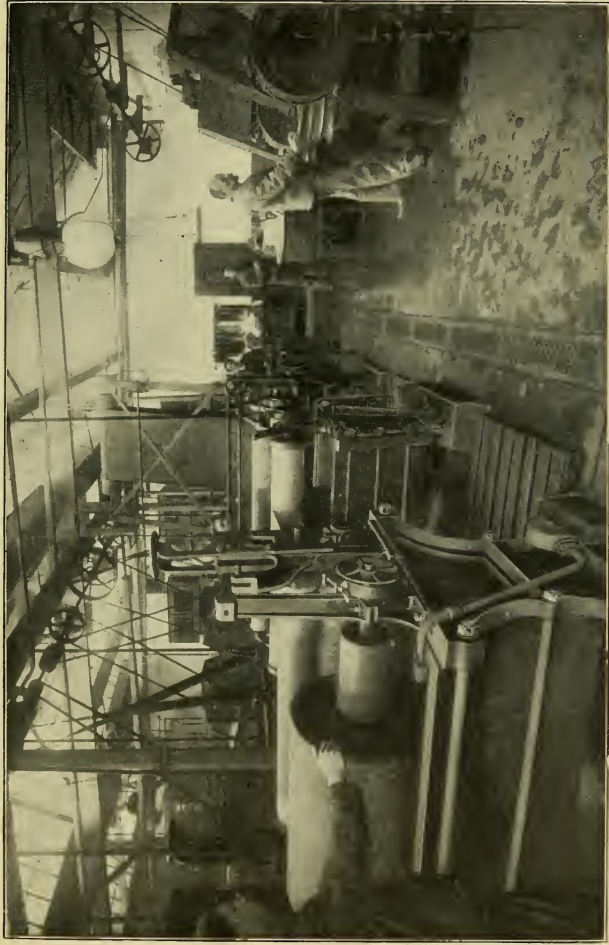
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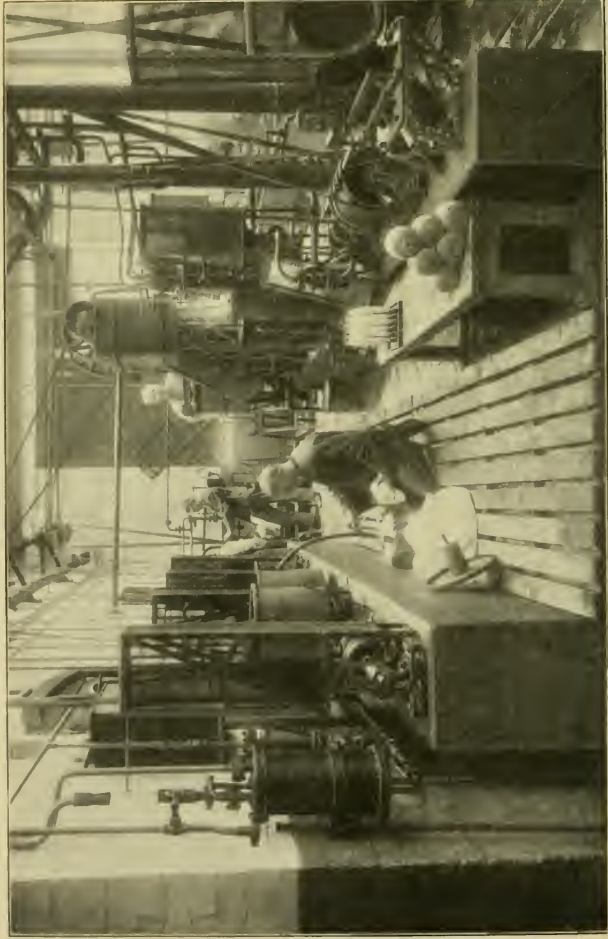
Second Main Section: Dyeing on a Large (Practical) Scale.

Experimental Dye-House



Third Main Section: Piece-Dyeing.

Experimental Dye-House



Fourth Main Section: Dyeing in Mechanical Apparatus.

PREFACE

TO THE FIRST EDITION.

In compliance with a long felt want and frequently expressed desire we have taken occasion, in addition to exhaustive works on the subjects of "Cotton Dyeing", "Wool Dyeing" and "Union Dyeing" etc. issued by us during the last few years, to publish

A MANUAL OF DYEING

as a kind of handy book for the dye-house in pocket-book form which gives particulars in a concise manner regarding the most important methods of dyeing.

The present Volume I deals with

THE DYEING OF COTTON AND ALLIED FIBRES.

In addition to the general methods of dyeing and a description of the special methods to be applied for the different classes of goods, we have included in this volume the much appreciated tabulations from our previous books indicating the dyestuffs and combinations thereof best adapted for producing the various shades. Great care has as usual been devoted by us to combining with comprehensiveness the greatest possible completeness.

We trust that this little volume will prove of equally good service in practice as our other works have done hitherto.

NEW YORK, May 1908.

CASSELLA COLOR COMPANY.

PREFACE

TO THE SECOND EDITION.

Owing to the recognition shown for the first edition of our

MANUAL OF DYEING

issued a few years ago and which very soon became out of print, we now feel behoved to publish a somewhat enlarged edition of the same, containing like its predecessor a full description of the

DYEING OF COTTON AND ALLIED FIBRES.

The volume is based on the same principles as the previous one and due attention has been paid to improvements and new styles, which have since been introduced.

We trust that this new edition will meet with a similar reception to that of its predecessor and will be equally well appreciated.

NEW YORK, October 1911.

CASSELLA COLOR COMPANY.

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GENERAL DIRECTIONS FOR THE APPLICATION OF COTTON COLOURS.

DISSOLVING OF COTTON COLOURS.

The dyestuffs are best dissolved in soft water free from lime, condensed water for preference. If calcareous water only be available, it should in the case of **Diamine**, **Immedial** and **Hydron Colours** be first boiled with the quantity of soda ash necessary for the dyeing. For **Basic Colours**, calcareous water should be acidulated slightly with acetic or formic acid.

Diamine Colours. Boiling water is poured over the dyestuff, and, after stirring well, the solution is passed through a fine sieve or a piece of cotton cloth into the dye-bath. Any undissolved particles are brought to solution by washing the filter with hot water or by boiling again with water.

Dyestuffs which are used frequently are often kept in stock solutions of 1—2 lbs dyestuff per 10 gallons water, repeated weighing off being thus avoided. (See page 9).

Immedial Colours. The Immedial Colours are to best advantage first mixed in wooden vessels with the amount of soda necessary for dyeing, some Monosolvol and a little warm water; after adding the quantity of sodium sulphide necessary for dyeing, they are then dissolved by pouring hot water over the paste, the whole being if necessary boiled up for a short while in order to ensure complete solution. Copper or brass vessels and fittings must be avoided.

The dye solutions, especially when dyeing in machines, are to best advantage added to the dyebath through a fine sieve or through a piece of thin cotton cloth.

For producing very light shades by machine-dyeing, it is an advantage to use clear sodium sulphide solutions for dissolving the Immedial Colours. The clear solution is prepared by dissolving the quantity of sodium sulphide requisite for one or two days in hot water (about double the quantity of water as of sodium sulphide), allowing to settle, and decanting the clear solution.

Note: The Immedial Colours must be stored in a dry place protected from moisture. The keg must be closed well after each drawing of dyestuff.

Hydron Colours. The *paste products* may be dissolved straightaway in the dyebath. The dyestuff is mixed with as soft water as available and the requisite amount of lye, and then added to the warm bath. Then the Hydrosulphite, which to advantage is previously dissolved with cold water, is stirred in. In a few minutes complete solution is accomplished.

The *powder products* before being added to the bath are made into a paste with five times their weight of cold or lukewarm water as free from lime as possible, to which $\frac{1}{2}$ —1 gallon methylated spirits per 10 gallons water has been added. This paste is then added through a fine sieve to the liquor, any portions remaining behind being crushed and washed in with water. Hereafter the lye and Hydrosulphite are added as in the case of the paste products.

Basic Colours are dissolved by pouring boiling water over the dyestuff, the solution being then added to the liquor through a filter or fine hair sieve. Dyestuffs harder to dissolve are mixed first with some acetic acid and then dissolved by pouring hot water over them.

Acid Colours. Brilliant Croceine, Scarlet, Eosine, Water Blue and likewise **Isamine Blue**, dissolve easily if boiling water is poured over them.

DIAMINE COLOURS.

In cotton dyeing, the Diamine Colours are applied as follows:

- A. Dyed direct;
- B. Aftertreated with Metallic Salts;
- C. Diazotised and Developed;
- D. Coupled with Nitrazol C or Paranitraniline C;
- E. Aftertreated with Formaldehyde;
- F. Aftertreated with Chloride of Lime (Primuline).

GENERAL DIRECTIONS FOR DYEING DIAMINE COLOURS.

For details regarding the dissolving of the Diamine Colours see page 3.

The dyebath is prepared with the dyestuff and the following ingredients, calculated on the weight of the cotton:

For light shades:

- 0.5—1% soda ash
 - 0.5—1% soap, Turkey-red oil or Monosovol;
- for slightly fuller shades it is an advantage to add also
- 3—5% phosphate of soda or
 - 2—3% Glauber's salt crystals
- in order to effect a better exhaustion.

When working with very hard water, it is best to omit the soap or oil.

Dye for about $\frac{1}{2}$ hour at 50—80° C. (120—175° F.) in a very dilute liquor.

For medium and deep shades:

- $\frac{1}{2}$ —2% soda ash and
- 10—20% desiccated Glauber's salt or common salt.

Dye boiling hot for about $\frac{3}{4}$ to 1 hour, best with indirect steam, in a short liquor.

The following dyestuffs are dyed *without soda and with the addition of salt only*:

Diamine Fast Yellow A, AR	Diamine Green B, G
Diamine Catechine 3G	Oxy Diamine Brown G
Diamine Bronze G	Diamine Fast Grey RN
Oxy Diamine Blue,	Diaminogene Blue,
all brands	all brands.
Diamine Scarlet B, 3B	

When dyeing goods containing size, or when using vessels or machines of copper, it is an advantage to dye without soda or at all events with very little soda only.

Diamine Yellow N and *Diamine Fast Yellow 3G* are dyed with the addition of 2% soap and 5—10% phosphate of soda in as soft water as possible.

Exhausting the Baths. When producing medium and deep shades, the baths do not exhaust completely. The exhaustion is dependent on the volume of liquor used, the longer the baths, the more dyestuff remaining therein. When dyeing for instance in a volume of liquor 17—20 times the weight of the goods, about one-quarter to one-third the quantity of dyestuff used remains over, so that correspondingly less dyestuff should be added when dyeing subsequent lots. Of soda, Glauber's salt etc., about one-quarter to one-fifth the quantities used for the starting bath are sufficient for subsequent lots.

The salt assists in exhausting the dyebaths; when using the baths continuously, such addition may however by accumulation have a detrimental effect, and it is therefore advisable to test the baths from time to time by means of the hydrometer. For medium shades, the cold bath should not generally show more than $1\frac{1}{2}$ —2° Tw., and the addition of salt should therefore be omitted for some lots when such specific gravity has been attained.

Salt. Common salt and desiccated Glauber's salt have approximately the same effect, whereas of Glauber's salt crystals about double the quantity is necessary to ensure the same effect. For delicate shades, and in machine-dyeing, Glauber's salt crystals should be given the preference owing to its greater purity.

A. DIAMINE COLOURS FOR DIRECT DYEING.

Pink:

Diamine Rose B extra, BD, BG, FFB, FFB extra,
Direct Rose T. [GD, GGN.

Red:

Diamine Red 4B, 5B, 6B, 10B, D, DN.
Cotton Red A.
Diamine Purpurine B, 3B, 6B, V.
Diamine Scarlet B, 3B.
Diamine Brilliant Scarlet S.
Diamine Fast Red F, 8BL.
Diamine Fast Scarlet GG, GFF, 4BFF, 4BFS, 5BFF,
7BFF, 8BF, 8BN, 10BF.

Claret:

Diamine Bordeaux B, S, BR, VRO.
Diamine Fast Bordeaux 6BS.
Diamine Violet Red.
Diamine Brilliant Rubine S.
Diamine Brilliant Bordeaux R.

Yellow:

Thioflavine S.
Oxy Diamine Yellow TZ, GG, NY 200, NYH, CR.
Diamine Fast Yellow A, AR, AGG, B, C, FF, M, 3G.
Diamine Gold.
Diamine Yellow CP, CPO, CPI, CPII.
Diamine Yellow N.

Orange:

Diamine Orange B, G, D, F.
Oxy Diamine Orange G, R.
Diamine Fast Orange EG, ER.

Green:

Diamine Green B, G, NA, CL, BO, BZ, FG.
Diamine Dark Green N.

Blue:

Diamine Sky Blue, FF, FFN, FFS.
Diamine Pure Blue A
Diamine Blue AZ, BG, BX, 2B, 3B, 6G, 3R, NC, RW,
No. 50, 52, 52a, 53, 53a, 55, 56.
Diamine Brilliant Blue G.
Diamine New Blue G, R.
Diamine Deep Blue B, R.
Diamine Steel Blue L.
Oxy Diamine Blue B, G, 3G, 5G, R, 3R.
Diamine Azo Blue R, RR, No. 51, 54.

Diamine Dark Blue B.
 Diamineral Blue B, BF, 3B, R, RV, CV, CVB, 3RC.
 Diamine Fast Blue FFB, FFG, G, BN.
 Diamine Fast Brilliant Blue R.
 Diamine Bengal Blue G, R.

Violet:

Diamine Violet N, BB, RB.
 Diamine Fast Violet FFBN, FFRN.
 Diamine Brilliant Violet B, RR.
 Oxy Diamine Violet B, BF, G, R.
 Diamine Heliotrope B, G, O.

Brown:

Diamine Brown B, 2G, 3G, 5G, M, MR, MRD, R, S,
 SD, V, ATC, No. 30a, 31, 32, 33, 34, 34N, 35, 36,
 37, 38, 39, 40, 41, 42, 43, 44, 45.
 Diamine Fast Brown G, R, GB.
 Diamineral Brown G.
 Diamine Nitrazol Brown BD, RD, T.
 Oxy Diamine Brown G, 3GN, RN, KS, KBS, KMS,
 Cotton Brown A, N. [KRS.
 Cotton Dark Brown BB, BM.
 Diamine Catechine B, G, 3G, BZ.
 Diamine Bronze G, ST.
 Diamine Bronze Brown PE.

Grey:

Diamine Grey G.
 Diamine Fast Grey BN, RN.

Black:

Diamine Black BH, BHN, BHR, BO, RO, ROO, DB,
 Diamine Blue Black E, R. [DN, HW.
 Diamine Jet Black Cr, OO, RB, SS.
 Diamine Fast Black F, C high conc., CB high conc.,
 X, XN, extra conc.
 Oxy Diamine Black A, AM, AT, D, FFC, RR.
 JB, JE, JEI, JW, JWF.
 SA, US, UI.
 B, BM, N, NR, WBZ.
 SOOO.
 Oxy Diamine Black A extra conc., AM extra conc.,
 FFC extra conc., FFN extra conc., FM extra conc.
 JB extra conc., JE extra conc., JEI extra conc.,
 JW extra conc., JWB extra conc., JWF extra conc.,
 JWN extra conc., JWF superior.
 SA extra conc., UI extra conc.

Para Diamine Black B, BB, FFB,
 B extra conc., BB extra conc.,
 FF extra conc., FFA extra conc.,
 FFB extra conc., FFD extra conc.,
 FFB high conc., FFD high conc.

Oxy Diamine Carbon JB, JEL.

Oxy Diaminogene ED, EF, EM, FF, FFG, FFN,
 OB, OBB, OT, OT extra.

Diaminogene B, BR, BW, CCL, extra.

Any of the Diamine Colours may be used for the production of self shades or of deep compound shades.

For light compound shades, the following best levelling Diamine Colours are usually given the preference:

DYESTUFFS FOR LIGHT COMPOUND SHADES.

Diamine Fast Yellow A,	Oxy Diamine Brown 3GN
AR, AGG, B, FF	Diamine Fast Blue FFB,
Diamine Fast Orange EG,	FFG, G
Diamine Orange G [ER	Diamine Fast Brilliant
Oxy Diamine Orange G	Blue R
Diamine Rose BD, GD, FFB	Diamine Sky Blue,
Diamine Brilliant Scarlet S	all brands
Diamine Fast Scarlet GFF,	Diamine Pure Blue A
4BFF	Diamine Fast Grey BN
Diamine Brilliant Bordeaux	Diamine Dark Blue B
R	Diamine Black BH
Diamine Fast Brown G, R,	Diaminogene B, extra
Diamine Brown R, MR [GB	Oxy Diamine Violet BF
Diamine Catechine B	Diamine Heliotrope B, G, O.
Diamine Bronze Brown PE	

These dyestuffs are mostly adapted also for *subsequent shading*; the following brands are particularly to be recommended for this purpose, and may be kept ready for use in solutions of 2 lbs dyestuff per 10 gallons condensed water:

DYESTUFFS FOR SUBSEQUENT SHADING.

<i>As yellow agents:</i>	Diamine Fast Yellow B, FF, A.
<i>As red agents:</i>	Diamine Fast Scarlet GFF, 4BFF, Diamine Brilliant Scarlet S or Diamine Brilliant Bordeaux R.
<i>As brown agents:</i>	Diamine Catechine B, Diamine Brown R, Diamine Fast Brown G, R.
<i>As saddening agents:</i>	Diamine Fast Blue FFB, Diamine Dark Blue B, Diaminogene B, extra.

B. DIAMINE COLOURS FOR AFTERTREATMENT WITH METALLIC SALTS.

The following products are suitable for an aftertreatment:

<p>With Copper Sulphate or with a mixture of Copper Sulphate and Bichrome.</p> <p>The brands marked with an asterisk (*) are to advantage aftertreated with a mixture of copper sulphate and bichrome.</p>	<p>With Bichrome.</p> <p>The brands marked with an asterisk (*) may also be aftertreated with chromium fluoride or chrome alum instead of with bichrome.</p>
<p>Blue and Violet:</p> <p>Diamine Sky Blue FF, FFN, FFS</p> <p>Diamine Blue RW, 3R, AZ</p> <p>Diamine Brilliant Blue G</p> <p>Diamine New Blue R</p> <p>Oxy Diamine Blue, all brands</p> <p>Diamineral Blue R*, 3B*, B*, BF*, CV, CVB</p> <p>*Diamine Deep Blue R</p> <p>*Diamine Bengal Blue G</p> <p>Diamine Dark Blue B</p> <p>Diamine Fast Violet FFBN.</p> <p>Brown:</p> <p>Diamine Brown 3G, M*, B*, R*, MR*</p> <p>Diamine Catechine 3G*, G*, B</p> <p>*Oxy Diamine Brown 3GN,</p> <p>*Diamineral Brown G [RN</p> <p>*Diamine Bronze G.</p> <p>Red:</p> <p>Diamine Fast Scarlet GG, GFF, 4BFF, 5BFF, 7BFF</p> <p>Diamine Brilliant Rubine S.</p> <p>Orange and Yellow:</p> <p>Diamine Orange B</p> <p>*Diamine Fast Yellow 3G.</p> <p>Grey and Black:</p> <p>*Diamine Fast Grey BN</p> <p>*Diamineral Black B, 3B, 6B</p> <p>*Diamine Fast Black F.</p>	<p>Brown and Bronze:</p> <p>Diamine Brown B, M, R</p> <p>*Diamine Catechine G, 3G</p> <p>*Diamine Bronze G.</p> <p>Blue:</p> <p>Diamine Dark Blue B.</p> <p>Yellow:</p> <p>*Diamine Yellow N.</p> <p>Red:</p> <p>*Diamine Fast Red F.</p> <p>Green:</p> <p>*Diamine Green G.</p> <p>Grey and Black:</p> <p>*Diamine Fast Grey BN</p> <p>*Diamine Jet Black Cr, OO, RB, SS</p> <p>*Diamine Fast Black X</p> <p>*Diamineral Black B, 3B, 6B.</p>

For *shading dyeings aftertreated with copper sulphate alone or with a mixture of copper sulphate and bichrome*, the following Diamine Colours may likewise be used:

Diamine Fast Blue,	Diamine Orange G, D
all brands	Diamine Yellow CP
Diaminogene extra	Thioflavine S
Diamine Brown S, R	Diamine Fast Yellow A, B,
Diamine Fast Brown G,	Diamine Bordeaux S [FF
R, GB	Diamine Brilliant Bordeaux
Diamine Fast Orange	R.
EG, ER	

For *shading dyeings to be aftertreated with bichrome, chromium fluoride or chrome alum*, any of the Diamine Colours may be used.

As a *yellowing agent for dyeings to be aftertreated*, Diamine Fast Yellow B, FF and A are the best adapted.

AFTERTREATMENT WITH SULPHATE OF COPPER.

An aftertreatment with copper sulphate improves the fastness to light very considerably and likewise improves the fastness to washing.

According to the depth of shade to be produced,

1—3% copper sulphate	} calculated on the weight of the cotton,
2—5% acetic acid 8° Tw.*	

should be used, the operation being carried out mostly in a hot bath.

AFTERTREATMENT WITH BICHROME AND SULPHATE OF COPPER.

This aftertreatment increases the fastness both to light and washing very considerably.

According to the depth of shade to be produced,

1—2% bichrome	} calculated on the weight of the cotton,
1—2% copper sulphate	
2—5% acetic acid 8° Tw.*	

should be used, the operation being carried out in a hot or boiling bath.

* Formic acid may be used in the place of acetic acid.

AFTERTREATMENT WITH BICHROME, CHROME ALUM AND CHROMIUM FLUORIDE.

This aftertreatment improves the fastness to washing considerably without affecting the fastness to light.

According to the depth of shade to be produced, the following quantities are used:

2—3% of the above salts	} calculated on the weight of the cotton,
2—5% acetic acid 8° Tw.*	

the operation being carried out in a hot to boiling bath.

Note. *Bichromate of soda* may at any time be substituted for bichromate of potash.

The aftertreating baths must at all times remain perfectly clear, showing an acid reaction; the addition of acetic or formic acid is therefore absolutely necessary.

AFTERTREATMENT WITH ALUMINA SALTS.

Alumina salts increase the resistance of every Diamine Colour to washing and steaming, in particular ensuring good fastness to water.

After rinsing, the dyed cotton is treated for 10 to 20 minutes in a lukewarm bath containing about $\frac{1}{2}$ pint aluminium acetate of $4\frac{1}{2}^{\circ}$ Tw., or $4\frac{1}{2}$ —6 oz aluminium sulphate or 8 oz alum, per 10 gallons liquor; it is then whizzed or squeezed off, and dried straightaway. (See paragraph on "Dyeings Fast to Water").

Nickel and *Cobalt* salts have a similar effect to that of sulphate of copper, and *iron* salts (acetate of iron) act similarly to alumina salts; they do not however effect quite the same improvement as the other metallic salts applied for the same purpose, and are therefore not of much importance.

* Formic acid may be used in the place of acetic acid.

C. DIAMINE COLOURS DIAZOTISED AND DEVELOPED ON THE FIBRE.

The diazotising and developing on the one hand increase the intensity of the dyeings considerably, and on the other effect a change in shade; in either case the dyeings are improved in fastness to washing, and frequently also in fastness to light and acid cross-dyeing.

The following products are suited for *diazotising* and *developing*:

Red and Claret:

Primuline
Diamine Azo Scarlet A,
B, 4B, 8B
Diamine Azo Bordeaux B.

Black and Dark Blue:

Diaminogene B, BR, BW,
CCL, extra
Oxy Diaminogene OB, OBB,
OT, OT extra, ED, EF,
EM, FF, FFG, FFN, OV
Diamine Black BH, BHN,
BHR, BHS conc., BO, RO,
ROO, DB, DN
Diamine Beta Black B,
BB, BGH
Diamine Azo Black B, R
Diamine Blue Black E.

Blue and Navy Blue:

Diaminogene Sky Blue N
Diaminogene Blue BB, G,
NA, NB, 2RN, 3RN, 6RN
Diaminogene Dark Blue
Diamine Azo Blue 6B, R, 2R
Diamine Heliotrope B, G, O
Oxy Diamine Violet BF.

Brown:

Diamine Brown M, S, V
Cotton Brown A, N
Diamine Cutch.

Grey:

Diamine Blue 2B, 3B.

The following dyestuffs for *shading* may be dyed in conjunction with the above mentioned:

Diamine Fast Yellow,	Diamine Fast Blue,
all brands	all brands
Diamine Orange B, G	Diamine Blue 3R
Diamine Fast Orange	Diamine New Blue R
EG, ER	Diamineral Blue R, CVB
Diamine Fast Scarlet,	Diamine Steel Blue L
all brands	Diamine Green B, G
Diamine Fast Red F	Diamine Fast Brown G, R,
Diamine Bordeaux S	Diamineral Brown G [GB
Diamine Violet N	Diamine Black HW
Oxy Diamine Violet B, R, G	Diamine Fast Black F.

The Diamine Colours to be developed are dyed according to the directions on pages 5 and 6.

Diazotising: The dyed cotton is rinsed in cold water, and then treated for 10 to 15 minutes in a cold bath.

for light and medium shades	for deep shades with
with	
1.5—2% nitrite of soda	2.5—3% nitrite of soda
5% hydrochloric acid	7.5% hydrochloric acid
of 32° Tw., or	of 32° Tw., or
3% sulphuric acid of	5% sulphuric acid of
168° Tw.	168° Tw.

The cotton is at once lightly rinsed in water acidulated with hydrochloric acid, and then developed without delay.

The diazotised dyeings should not be left lying for any length of time before the developing.

For *dyeing further lots in the same bath*, only one-third to one-half of the quantities used for starting are required.

When *diazotising in a very short liquor in dyeing machines, or in the jigger*, smaller quantities of nitrite of soda and acid will be found sufficient as indicated in the respective chapters.

Developing: Immediately after the diazotising and rinsing, the goods are treated for 15 to 30 minutes in the cold developing bath, then rinsed, and soaped if necessary.

The dissolving of the developers and the preparing of the developing baths may be seen from the opposite page.

The quantities of the different developers required may be calculated on the following basis:

	For developing of	
	approx. 2% dyeings	approx. 4—5% dyeings
Beta Naphtol	0.45 0/0	0.9 0/0
Resorcine	0.35 0/0	0.7 0/0
Phenol	0.25 0/0	0.5 0/0
Phenylene Diamine Powder .	0.35 0/0	0.7 0/0
Diamine BB	0.4 0/0	0.8 0/0
Fast Blue Developer AD . .	0.75 0/0	1.5 0/0
Bordeaux Developer	0.5 0/0	1 0/0
Naphtylamine Ether Powder	0.75 0/0	1.5 0/0
Naphtylamine Ether N Powder	0.75 0/0	1.5 0/0

These proportions are to be understood for the first developing bath; if the baths are used continuously, the

Continuation page 16.

quantity of developer is reduced by about one-quarter. When working with very dilute baths (more than 20 times the weight of liquor as of goods), a correspondingly larger addition of developer in solution is required.

Developed colours may be varied in shade by employing the *different developers in mixture with one another*, viz.,

Beta Naphtol	with Resorcine
Beta Naphtol	„ Phenylene Diamine
Phenylene Diamine	„ Resorcine
Naphtylamine Ether	„ Fast Blue Developer AD.

An addition of *sulphate of copper* to the diazotising bath, or better still an aftertreatment of the developed dyeings with sulphate of copper, will in most cases improve the *fastness to light*. The same quantity of sulphate of copper is used as indicated on page 11.

For *shading*, the developed dyeings may be topped with *Basic Colours* in the same way as direct dyeings; in some instances the Basic Colours for topping may also be added to the diazotising liquor.

Boiling with Soda. With some of the Diamine Colours, notably with *Diamine Cutch*, the developing operation may be replaced by a simple *treatment with soda*. This method is carried out by diazotising in the customary manner, then rinsing without adding any acid, and treating straightaway for 15 to 20 minutes in a fresh bath of 40—50° C. (105—120° F.) with

2.5% soda ash for *light shades* and
5 % soda ash for *deep shades*.

The goods are then rinsed in the customary manner.

D. DIAMINE COLOURS COUPLED ON THE FIBRE WITH NITRAZOL C OR PARANITRANILINE C.

The dyeings obtained by coupling possess good fastness to washing and milling, and many of them also good fastness to acid cross-dyeing and light.

For coupling, the following dyestuffs are very well suited:

Black:

Diamine Nitrazol Black B, BB, KG, KR.
Oxy Diamine Black A, AM, D, JB, JE, JEI, JW, JWF, UI, A extra conc., AM extra conc., JB extra conc., JE extra conc., JEI extra conc., JW extra conc., JWB extra conc., JWF extra conc., JWN extra conc., JWR extra conc., UI extra conc., JWF superior.
Oxy Diamine Carbon JB, JEI.

Blue:

Diamine Blue NC.
Diamine Bengal Blue G.
Diamineral Blue CV, CVB, 3RC.

Green:

Diamine Nitrazol Green BB, GF, S.

Brown:

Diamine Brown MR, S, V.
Diamine Nitrazol Brown B, BD, G, GF, RD, T.
Oxy Diamine Orange G, R.
Oxy Diamine Brown G, RN.
Cotton Brown A, N.

Ciaret and Red:

Diamine Nitrazol Bordeaux GB.
Diamine Nitrazol Scarlet A.

Orange:

Diamine Nitrazol Orange R.

Yellow and Mode Shades:

Primuline.
Diamine Fast Yellow A, AR.
Diamine Bronze G.
Diamine Grey G.

For *dark browns*, the following come into consideration:

Diamine Jet Black OO, SS, Cr, RB.
Oxy Diamine Black SA, RR, SA extra conc.

The *coupling* is effected by treating the dyed and rinsed cotton for $\frac{1}{2}$ hour in one of the coupling baths prepared with Nitrazol C or diazotised Paranitraniline C (see below).

The cold coupling bath is charged successively with the solutions of Nitrazol or diazotised Paranitraniline, soda and acetate of soda; in this bath the cotton is treated for $\frac{1}{2}$ hour and then rinsed.

When *coupling dyeings on loose cotton or in machines*, it is well to omit the addition of soda or acetate of soda, and to increase the quantity of Nitrazol or Paranitraniline by one-quarter to one-third; and it is an advantage when working in machines to extend the coupling process, particularly when using the packing system, and to add the Nitrazol in two or three lots; the additions are best made while the pump is working the liquor from inwards to outwards.

For *shading the dyeings*, small quantities of *Basic Colours* may be added to the coupling bath, e. g. for Black 0,2—0,3% Methylene Blue BB.

a) Coupling with Nitrazol C.

For 100 lbs cotton.

for $1\frac{1}{2}$ —2% dyeings with	for 3—4% dyeings with
2 lbs Nitrazol C	3 —4 lbs Nitrazol C
$\frac{1}{2}$ lb soda ash	$\frac{3}{4}$ —1 lb soda ash
$3\frac{1}{4}$ oz acetate of soda	$3\frac{1}{4}$ —4 oz acetate of soda.

To dissolve the Nitrazol C, it should be stirred up with a little cold water (20—25° C. or 68—77° F.). Any lumps that may remain should be carefully crushed, the Nitrazol being finally brought into solution by pouring a sufficient quantity of cold water over it.

b) Coupling with Paranitraniline C.

For 100 lbs cotton.

for 1½—2% dyeings with		for 3—4% dyeings with	
3½ gallons	diazotised Paranitraniline C	about 5—7 gallons	diazotised Paranitraniline C
½ lb	soda ash	¾—1 lb	soda ash
3¼ oz	acetate of soda	5—6½ oz	acetate of soda.

Paranitraniline is diazotised as follows:

Dissolve

- 2 lbs Paranitraniline C with
- 1½ gallons boiling condensed water, stir well, and then add
- ½ gallon hydrochloric acid 32° Tw.; after some stirring, all will be dissolved; then add
- 3½ gallons cold water, which precipitates the hydrochloride of Paranitraniline in the form of a yellow paste.

This solution should always be prepared a few hours before use in order to cool down.

When quite cold, add

- 1 lb 1 oz nitrite of soda dissolved in
- 1 gallon cold water, agitating the mixture. After about 20 minutes, a clear solution results, which is then brought up to
- 20 gallons with cold water.

The diazo solution will keep for some time if preserved in wooden or earthen vessels and protected from heat or sunlight.

E. DIAMINE COLOURS FOR AFTERTREATMENT WITH FORMALDEHYDE.

By the aftertreatment with formaldehyde, especially the fastness of the dyeings to washing and milling is enhanced.

The following dyestuffs are suited for this purpose:

Black:

Oxy Diamine Black UI, US, SA, UI extra conc.
SA extra conc.

JB, JE, JEI, JW, JWF.

JB extra conc., JE extra conc., JEI extra conc., JW extra conc., JWB extra conc., JWF extra conc., JWN extra conc., JWR extra conc., JWF superior.

Para Diamine Black B, BB, FFB, B extra conc., BB extra conc., FF extra conc., FFA extra conc., FFB extra conc., FFD extra conc.

Oxy Diamine Carbon JB, JEI.

Diamine Fast Black X, XN extra conc.

Blue:

Diamineral Blue R, CVB.

Brown:

Diamine Brown S, M, MR, ATC.

Diamine Fast Brown R, G.

Diamine Nitrazol Brown G, RD.

Orange:

Diamine Fast Orange EG, ER.

The cotton is dyed according to the general directions (page 5) and rinsed, then treated for 20 to 30 minutes in a hot to boiling bath with

3% formaldehyde, to which

1—2% bichrome may to advantage be added,
and rinsed.

F. DIAMINE COLOURS FOR AFTERTREATMENT WITH CHLORIDE OF LIME.

Primuline aftertreated with chloride of lime yields a bright yellow-orange shade of eminent fastness to light, washing, stoving, hot pressing, and acid cross-dyeing.

Cotton dyed (direct) with *Primuline* is treated for $\frac{1}{2}$ hour in a cold, clear chloride of lime bath of $\frac{3}{4}^{\circ}$ Tw., then rinsed, acidulated with hydrochloric acid, and again thoroughly rinsed.

Matching-off of Aftertreated Dyeings. When carrying out the above-mentioned methods of aftertreatment (after-treating with metallic salts, diazotising, coupling, etc.), the matching is best done by taking a small sample of the goods, and subjecting it to the aftertreatment. In the case of shades which are frequently repeated, a sample of the dyeing before the aftertreatment may be preserved, the subsequent lots being then dyed and matched in accordance with this sample.

IMMEDIAL COLOURS.

Dissolving the dyestuffs: See page 3.

Dye-Vessels. For dyeing with Immedial Colours, wooden or iron vessels are usually employed; vessels or fittings of copper or brass are not suited for the purpose.

Only the liquor is affected by copper; the dyed cotton on the other hand may safely be brought into contact with any kind of metal after the rinsing.

Additions to the Dyebaths. Sodium sulphide, soda and common salt or Glauber's salt are as a rule used in the dyeing. The quantities required for the various dyestuffs will be found in the subsequent tables.

The *sodium sulphide* serves the purpose of dissolving the dyestuff and keeping it in solution; it is important therefore that the bath should always contain a sufficient amount of sodium sulphide. The best way to determine this is to dip a stick into the liquor and to spot it on to filter paper. The spot produced on the paper will be clear and coloured if the dyestuff is sufficiently well dissolved, and the diffusing liquor will form a coloured halo. If on the other hand a precipitate appears when spotting the paper and a colourless liquid diffuses into the paper, some sodium sulphide will have to be added to the bath. This addition is the more necessary when the bath has been standing unused for some time.

A slight excess of sodium sulphide is no disadvantage, but a large excess retards the absorption so that the dyeings turn out lighter in shade.

Light shades always require a little more sodium sulphide (in proportion to the quantity of dyestuff) than dark shades.

Soda is added partly in order to intensify the action of the sodium sulphide and partly also to correct the hardness of the water.

Common salt and *Glauber's salt* assist the absorption of the dyestuffs and accelerate it.

The addition of salt should therefore be rather small, or should be omitted entirely, in the case of light shades and of material difficult to dye through, and further also

in the dyeing of goods which have a great affinity for the dyestuff (mercerised yarns for instance).

When dyeing dark shades in a standing bath, it is advisable, same as for the Diamine Colours (see page 6), to test the bath from time to time for the quantity of salt it contains. For medium shades the bath should not titrate more than 4° Tw. and for deep shades not more than 7—9° Tw.; for blacks however the specific gravity may be rather higher (10—12° Tw.); but when these limits are reached, no more salt should be added.

Common salt and Glauber's salt show about the same behaviour as in the dyeing of Diamine Colours.

Double the quantity of Glauber's salt crystals is required as of desiccated Glauber's salt or of common salt; for machine-dyeing in particular crystallised Glauber's salt should be given the preference.

Other ingredients to be mentioned are *Turkey-red oil*, *Monosolvol*, *glucose* and *glue*.

Turkey-red oil, *Monosolvol*, etc. are added in order to effect a more gradual absorption and better penetration, but in the case of very hard water these ingredients are best omitted.

Glucose or *grape sugar* increases the solubility of some of the Immedial Indone brands, more level and fuller shades being thereby obtained.

Glue enhances the brightness of dyeings of Immedial Bordeaux, Immedial Maroon, Immedial Red Brown and Immedial Prune, about one-fifth of the weight of the dyestuff being added to the dyebath.

Volume of Liquor. As a rule, the Immedial Colours are dyed in as short baths as practicable. The recipes given further on are understood for a volume of liquor about 20 times the weight of the goods to be dyed. For more dilute liquors, the starting baths have to be charged with larger quantities of dyestuff, and the more dilute the liquor, the larger should be the addition for the starting bath.

Temperature of the Baths. Light shades as a rule are dyed in a warm to hot bath, and dark shades boiling hot. Some dyestuffs are however to better advantage dyed at a lower temperature in deep shades. A number of Immedial Colours moreover may be dyed equally well at a lower temperature (see the dyeing of Diamine and Immedial Colours in a cold or lukewarm bath, pages 40 and 41).

Squeezing off and Rinsing. After dyeing, yarns and piece-goods are pressed off as thoroughly as possible, and then as a rule rinsed immediately. Dyeings of Immedial Indone and Immedial Sky Blue are to advantage oxidised for a short time in the air before rinsing. Immedial Blue and Immedial New Blue, if they are to be developed by steaming or smothering, are rinsed after the developing only, but if not to be developed in this manner, they are rinsed immediately after the squeezing off. Loose cotton, instead of being squeezed off, is thrown into baskets, in order to drain, and may also be hydroextracted, by which means the dyestuff is recovered better; the cotton is then rinsed in the same way as yarn and piece-goods. Regarding the treatment in mechanical apparatus see the chapter on this subject.

Matching-off of Shades For matching difficult shades exactly, it is essential to rinse the dyeings well in order to remove the alkali contained in the cotton.

In order to increase the effect of the rinsing, it is advisable in such cases to add a little acetic or formic acid to the last rinsing bath, or to aftertreat with metallic salts (bichrome and acetic acid, or sulphate of copper, bichrome and acetic acid).

The sample taken for the matching is treated in a similar manner before the matching.

Shading the Dyeings. This is done as a rule by adding the respective Immedial Colours to the dyebath.

If the goods require a slight shading only, this may in some cases be done with Diamine or Basic Colours in a cold to lukewarm soap bath.

Certain Diamine and Basic Colours may for shading be added straightaway to the bath of Immedial Colours; these products are indicated on page 40.

Stripping the Dyeings. If dyeings produced with Immedial Colours have turned out too dark, and are to be stripped in part in order to correct their shade, they may be treated for a few minutes, or up to $\frac{1}{2}$ hour, in a boiling hot bath with $\frac{1}{4}$ —1 lb sodium sulphide crystals per 10 gallons water, being then rinsed, or dyed straightaway to shade. A short treatment in a cold solution of sodium sulphide is very well adapted for improving the fastness to rubbing and washing of deep shades produced with Immedial Colours.

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Instead of the quantities of sodium sulphide *crystals* given in the following tables, half those quantities of sodium sulphide *conc.* may always be used.

Name of the Colour	Dyeing Directions for loose Cotton, Yarn and Fabrics. (The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)				
Black:					
Immedial Black		Dyestuff	Sodium Sulphide Cryst.	Soda Ash	Desiccated Glauber's Salt or Common Salt
V extra	For Grey:				
FF extra	Starting bath:	1—6 %	4—6 %	3—4 oz per 10 gall.	0—8 oz per 10 gall.
G extra	For subsequent lots:	0.75—4.5%	2—4.5 %	0.1—0.2 %	—
NB	For Black:				
NG	Starting bath:	15—24 %	12—18 %	4—8 oz per 10 gall.	2—3 lbs per 10 gall.
NF	For subsequent lots:	10—15 %	7.5—10 %	0.2—0.5 %	0—5 %
NR					
NRT					

Immedial Black

For dyeing directions see below.

BF conc.					
NBB conc.		Dyestuff	Sodium Sulphide Cryst.	Soda Ash	Desiccated Glauber's Salt or Common Salt
NLN conc.	For Grey:				
NNR conc.	Starting bath:	0.75—4 %	4—6 %	3—4 oz per 10 gall.	0—8 oz per 10 gall.
NN conc.	For subsequent lots:	0.6—3 %	2—4.5 %	0.1—0.2 %	—
NNG conc.	For Black:				
NNZ conc.	Starting bath:	10—18 %	10—18 %	4—8 oz per 10 gall.	2—3 lbs per 10 gall.
Immedial	For subsequent lots:	6—10 %	6—10 %	0.2—0.5 %	0—5 %
Brilliant Black					
5BV conc.					
6BG conc.					
8BG conc.					

Dye for $\frac{1}{2}$ to 1 hour, grey shades in a warm to hot bath, and blacks near boiling temperature. Yarn and piece-goods are then squeezed off and rinsed immediately; loose cotton is allowed to drain or whizzed, and then rinsed.

In the case of *black*, 5—8 oz acetate or formate of soda are added per 10 gallons to the last rinsing bath if the goods are not given an alkaline brightening or softening; in place of these additions, soda ash (about 3—6 oz per 10 gallons) may also be used.

If the goods are aftertreated with metallic salts in accordance with the directions on page 35, the rinsing with acetate or formate of soda should follow upon this treatment.

More bloomy shades are obtained by exposing before drying the dyed and rinsed goods to the air.

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Name of
the Colour

Dyeing Directions for loose Cotton, Yarn and Fabrics.
(The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)

Black:

Immedial Carbon

B

BL

JHJ

KBG

KBL

R

Immedial

Brilliant Carbon

F

FB

FG

For Grey:

	Dyestuff	Sodium Sulphide Crystals	Soda Ash	Desiccated Glauber's Salt or Common Salt
Starting bath:	0.5—3 %	4—6 %	3—4 oz per 10 gall.	0—8 oz per 10 gall.
For subsequent lots:	0.4—2.25%	2—4.5 %	0.1—0.2 %	—

For Black:

	Dyestuff	Sodium Sulphide Crystals	Soda Ash	Desiccated Glauber's Salt or Common Salt
Starting bath:	7—12 %	14—20 %	4—8 oz per 10 gall.	2—3 lbs per 10 gall.
For subsequent lots:	4.5—7 %	9—12 %	0.2—0.5%	0—5 %

Immedial Carbon is dyed and treated exactly as given afore for Immedial Black.

Indo Carbon S

SF

For Grey:

	Dyestuff	Sodium Sulphide crystals	Soda Ash	Desiccated Glauber's Salt or Common Salt.
Starting bath:	0.75—4 %	4—8 %	3—4 oz per 10 gall.	0—8 oz per 10 gall.
For subsequent lots:	0.6—3 %	2—6 %	0.1—0.2%	—

For Black:

	Dyestuff	Sodium Sulphide crystals	Soda Ash	Desiccated Glauber's Salt or Common Salt.
Starting bath:	10—18 %	20—30 %	4—8 oz per 10 gall.	2—3 lbs per 10 gall.
For subsequent lots:	6—10 %	12—15 %	0.2—0.5%	0—5 %

Dye for about $\frac{1}{2}$ to 1 hour near boiling temperature. Yarn and piece-goods are squeezed off and rinsed; loose cotton is allowed to drain, or whizzed before rinsing.

After rinsing, the goods are aftertreated with bichrome and acetic acid in accordance with the directions on p. 35.

Half-wool fabrics containing a warp dyed with Indo Carbon may safely be dyed with sulphuric acid or bisulphate of soda, all that is needed being to rinse carefully after the acid dyeing. For sewing yarns also, which are exposed to an elevated temperature, and for yarns which are finally given an acid brightening, the Indo Carbons offer considerable advantages owing to their resistance to heat and acids. The same remarks apply for yarns which are woven up into fabrics to be stoved subsequently. Such fabrics must after the stoving be freed from the adhering sulphurous acid, which is best done by rinsing subsequently in a short, cold bath with hydrogen peroxide or perborate.

For 100 gallons rinsing liquor,

2—3 gallons peroxide of hydrogen and \ (the bath must have a
approx. 1—1 $\frac{1}{2}$ pint ammonia } slight smell of ammonia)
or 2—3 lbs perborate of soda

are used, the stoved goods after a very thorough rinsing being treated therein for about 10 minutes, then rinsed in fresh water, and dried.

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Name of
the Colour

Dyeing Directions for loose Cotton, Yarn and Fabrics.
(The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)

	Dyestuff	Sodium Sulphide Cryst.	Soda Ash	Desiccated Glauber's Salt or Common Salt
For light shades:				
Starting bath:	1-4 %	4-10 %	3-4 oz per 10 gall.	0-4 oz per 10 gall.
For subsequent lots:	0.7-2.5 %	2-5 %	0.1-0.2 %	-
For medium and deep shades:				
Starting bath:	4-20 %	10-40 %	4-8 oz per 10 gall.	4 oz-2 lbs per 10 gall.
For subsequent lots:	2.5-10 %	5-20 %	0.2-0.5 %	0-5 %

Dye for $\frac{1}{2}$ to 1 hour at a temperature of 40-60° C. (105-140° F.) for very bright shades, and for more covered shades, particularly in the case of combinations with Immedial Direct Blue, near boiling temperature.

Cotton yarn is squeezed off after the dyeing, wrung off very evenly on the wringing post, exposed to the air for $\frac{1}{2}$ to 1 hour, and rinsed.

Piece-goods after the dyeing are squeezed off, oxidised in the air by passing over guiding rollers, and then rinsed.

Loose cotton is thrown into baskets after the dyeing, and if possible whizzed; it is then left lying exposed to the air for some time, and rinsed.

By adding glucose to the dyebath — about one-half the weight of the dyestuff for the starting bath and $\frac{1}{4}$ th- $\frac{1}{5}$ th of the weight of the dyestuff for dyeing subsequent lots —, somewhat fuller shades are obtained.

By adding some Immedial Intensifier (about an equal weight as of dyestuff), fuller shades are likewise obtained in the dyeing; see also page 41.

Immedial Sky Blue Paste is dyed according to the above directions at a temperature of about 30-35° C. (85-95° F.), but with only about one-quarter the amount of sodium sulphide crystals indicated above for Immedial Indone.

Of Immedial Sky Blue Powder conc., only about one-half the amount of dyestuff is required as of the paste product, owing to its higher concentration. The other additions are the same as for the paste.

Blue Immedial
Colours which are
exposed to the air
after dyeing.

Immedial Indone
R conc.
RR conc.
RG conc.
RB conc.
B conc.
3B conc.
4B conc.
BF conc.
BBF conc.
BN conc.
JBF conc.
JBN conc.

Immedial Dark
Blue J

Immedial Sky
Blue Paste

Immedial Sky
Blue Powder
conc.

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Name of
the Colour

Dyeing Directions for loose Cotton, Yarn and Fabrics.
(The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)

Blue Immedial
Colours which do
not require an
oxidation after
dyeing.
Immedial Direct
Blue B
JB
OD
R
Immedial Dark
Blue CRV

	Dyestuff	Sodium Sulphide Cryst.	Soda Ash	Desiccated Glauber's Salt or Common Salt
For light shades:				
Starting bath:	1-4 %	4-6 %	3-4 oz per 10 gall.	0-8 oz per 10 gall.
For subsequent lots:	0.7-3 %	2-4.5 %	0.1-0.2 %	—
For medium and deep shades:				
Starting bath:	4-20 %	6-20 %	4-8 oz per 10 gall.	1½-2 lbs per 10 gall.
For subsequent lots:	3-12 %	3-12 %	0.2-0.5 %	0-5 %

For dyeing directions see below.

Immedial
Direct Blue
B extra conc.
BB extra conc.
4B extra conc.
FCL extra conc.
JB extra conc.
JND extra conc.
RC extra conc.

	Dyestuff	Sodium Sulphide Cryst.	Soda Ash	Desiccated Glauber's Salt or Common Salt
For light shades:				
Starting bath:	0.5-2 %	4-6 %	3-4 oz per 10 gall.	0-8 oz per 10 gall.
For subsequent lots:	0.35-15 %	2-4.5 %	0.1-0.2 %	—
For medium and deep shades:				
Starting bath:	2-10 %	6-20 %	4-8 oz per 10 gall.	1½-2 lbs per 10 gall.
For subsequent lots:	1.5-6 %	3-12 %	0.2-0.5 %	0-5 %

Dye for ½ to 1 hour, light shades in a warm to hot bath and dark shades near boiling temperature. Yarn and piece-goods are then squeezed off, and rinsed. loose cotton is allowed to drain or whizzed, and then rinsed.

The brightness of the shades can be increased by subjecting the dyeings to one or other of the following treatments:

1. Exposing the wet goods to the air,
2. Brightening hot with soap and soda,
3. Aftertreating with metallic salts
 - a) with bichrome
 - b) with bichrome and copper sulphate, or bichrome and nickel sulphate, which also enhances the fastness to washing and light,
 - c) with bichrome and bisulphite,

according to the directions on page 35.

4. By a treatment with Immedial Developer according to the directions on page 37.

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Name of
the Colour

Dyeing Directions for loose Cotton, Yarn and Fabrics.

(The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)

Blue Immedial
Colours which do
not require an
oxidation after
dyeing.

Immedial

Indogene

B conc.

GCL conc.

BCL conc.

RCL conc.

RRCL conc.

	Dyestuff	Sodium Sulphide Cryst.	Soda Ash	Desiccated Glauber's Salt or Common Salt
For light shades:				
Starting bath:	1-4 %	4-10 %	3-4 oz per 10 gall.	0-4 oz per 10 gall.
For subsequent lots:	0.7-2.5 %	2-5 %	0.1-0.2 %	—
For medium and deep shades:				
Starting bath:	4-20 %	10-40 %	4-8 oz per 10 gall.	1/4-2 lbs per 10 gall.
For subsequent lots:	2.5-10 %	5-20 %	0.2-0.5 %	0-5 %

Dye for 1/2 to 1 hour, pale and bright shades at 40-60° C. (105-140° F.), and more covered shades near boiling temperature. Immedial Indogene B conc., whatever the depth of shade, is dyed to best advantage near boiling temperature.

When the dyeing is complete, yarn and piece-goods are squeezed off and rinsed; loose cotton is allowed to drain or whizzed, and then rinsed.

Immedial Indogene may be used at will in combination with Immedial Direct Blue or any of the other Immedial Colours.

Immedial Green
Blue CV

Immedial Green Blue CV is dyed with the same additions as the single strength Immedial Direct Blue brands and in the same manner also. After dyeing, the goods are rinsed.

The aftertreatment is exactly the same as described for Immedial Direct Blue on the foregoing page.

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Name of the Colour	Dyeing Directions for loose Cotton, Yarn and Fabrics. (The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)				
Blue Immedial Colours which are dyed direct or developed. Immedial Blue C CB CR	For light shades:	Dyestuff	Sodium Sulphide Cryst.	Caustic Soda Lye 77° Tw.	Desiccated Glauber's Salt or Common Salt
		Starting bath:	2 — 6 %	4 — 6 %	1½ — 3 oz per 10 gall. 0 — 8 oz per 10 gall.
	For subsequent lots:	Starting bath:	1.5 — 4 %	2 — 4 %	0.1 — 0.2 % —
		Starting bath:	6 — 20 %	3 — 4 oz per 10 gall.	1½ — 2 lbs per 10 gall.
	For medium and deep shades:	Starting bath:	6 — 20 %	3 — 4 oz per 10 gall.	1½ — 2 lbs per 10 gall.
		For subsequent lots:	4 — 12 %	0.2 — 0.3 %	0 — 5 %

Dye for about ½ to 1 hour near boiling temperature, then treat as indicated on the opposite page for Immedial New Blue G conc.

Immedial Blue C extra conc. CB extra conc. CR extra conc.	For light shades:	Dyestuff	Sodium Sulphide Cryst.	Caustic Soda Lye 77° Tw.	Desiccated Glauber's Salt or Common Salt
		Starting bath:	1 — 3 %	4 — 6 %	1½ — 3 oz per 10 gall. 0 — 8 oz per 10 gall.
	For subsequent lots:	Starting bath:	0.75 — 2 %	2 — 4 %	0.1 — 0.2 % —
		Starting bath:	3 — 10 %	6 — 20 %	3 — 4 oz per 10 gall. 1½ — 2 lbs per 10 gall.
	For medium and deep shades:	Starting bath:	3 — 10 %	6 — 20 %	3 — 4 oz per 10 gall. 1½ — 2 lbs per 10 gall.
		For subsequent lots:	2 — 6 %	4 — 12 %	0.2 — 0.3 % 0 — 5 %

Dye for about ½ to 1 hour near boiling temperature, then treat as indicated on the opposite page for Immedial New Blue G conc.

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Name of
the Colour

Dyeing Directions for loose Cotton, Yarn and Fabrics.
(The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)

Blue Immedial
Colours which are
dyed direct or
developed.

Immedial New
Blue G conc.

	Dyestuff	Sodium Sulphide Cryst.	Caustic Soda Lye 77° Tw.	Desiccated Glauber's Salt or Common Salt
For light shades:				
Starting bath:	2— 6 %	6—12 %	1½—3 oz per 10 gall.	0—8 oz per 10 gall.
For subsequent lots:	1.5— 4 %	4— 8 %	0.1—0.2 %	—
For medium and deep shades:				
Starting bath:	6—20 %	12—30 %	3—4 oz per 10 gall.	½—2 lbs per 10 gall.
For subsequent lots:	4—12 %	8—18 %	0.2—0.3 %	0—5 %

Dye near boiling temperature for about ½ to 1 hour.

The dyed goods may be treated in various ways.

I. The goods, without rinsing, are freed as far as possible from adhering liquor by either squeezing off, wringing off or whizzing, the Blue being developed

- a) by smothering or
 - b) by steaming,
- and then rinsed.

II. The goods after dyeing are squeezed off, drained or whizzed, and rinsed straightaway. The shades, in order to increase their brightness, may be developed by one of the following methods:

- a) By brightening hot with soap and soda,
- b) by treating with bichrome,
- c) by treating with bichrome and copper sulphate, or bichrome and nickel sulphate,
- d) by treating with bichrome and bisulphite,
- e) by treating with Immedial Developer.

For full directions see pages 35 and 37—39.

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Name of the Colour	Dyeing Directions for loose Cotton, Yarn and Fabrics. (The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)				
		Dyestuff	Sodium Sulphide Cryst.	Soda Ash	Desiccated Glauber's Salt or Common Salt
Green and Olive: Immedial Brilliant Green G extra	For light shades:				
	Starting bath:	1— 4 %	4— 6 %	3—4 oz per 10 gall.	0—8 oz per 10 gall.
Immedial Green GG extra BB extra GGX conc. BBX conc. BBXN conc.	For subsequent lots:	0.7— 3 %	2— 4.5 %	0.1—0.2 %	—
	For medium and deep shades:				
	Starting bath:	4—20 %	6—20 %	4—8 oz per 10 gall.	1½—2 lbs per 10 gall.
Immedial Deep	For subsequent lots:	3—12 %	3—12 %	0.2—0.5 %	0—5 %
Green G	Dye for ½ to 1 hour, light shades in a warm to hot bath, and dark shades near boiling temperature. Yarn and piece-goods are then squeezed off and rinsed; loose cotton is allowed to drain or whizzed, and then rinsed.				
Immedial Dark					
Green B	For combinations of the various Immedial Greens with Immedial Yellow a little acetic acid is added to the last rinsing bath.				
Immedial Olive					
B					
GG					
3G					
Immedial					
Yellow Olive					
G					
5G					
Yellow and					
Orange:					
Immedial Yellow	Dye with the same additions and according to the same directions as given above for Green and Olive.				
GG					
D	For Immedial Yellow a little acetic acid is added to the last rinsing bath after the dyeing.				
Immedial Orange					
C					

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Name of
the Colour

Dyeing Directions for loose Cotton, Yarns and Fabrics.
(The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)

Brown:

Immedial Cutch

G

O

R

BG

BGG

Immedial Brown

B

BR

BRS

RR

W conc.

Immedial Yellow

Brown EN

Immedial Dark

Brown A

D conc.

DS

Immedial Khaki

D

G

Immedial Bronze

A

Immedial Prune

S

Immedial Red

Brown 3R

	Dyestuff	Sodium Sulphide Cryst.	Soda Ash	Desiccated Glauber's Salt or Common Salt
For light shades:				
Starting bath:	1 — 4%	4—6 %	3—4 oz per 10 gall.	0—8 oz per 10 gall.
For subsequent lots:	0.7— 3%	2—4.5 %	0.1—0.2%	—
For medium and deep shades:				
Starting bath:	4 —20%	6—20 %	4—8 oz per 10 gall.	1½—2 lbs per 10 gall.
For subsequent lots:	3 —12%	3—12 %	0.2—0.5%	0—5%

Dye for ½ to 1 hour, light shades in a warm to hot bath, deep shades near boiling temperature; yarn and piece-goods are then squeezed off, and rinsed; loose cotton is allowed to drain or whizzed, and then rinsed.

Immedial Brown BRS and Immedial Dark Brown DS are dyed as self shades without any sodium sulphide. When dyed in combination with other Immedial Colours, the amount of sodium sulphide requisite for the other brands is added.

Immedial Prune and Immedial Red Brown are dyed with the same ingredients and in the same way as given above. Brighter shades may be obtained by dyeing at a lower temperature (50—60° C. or 120—140° F.). An addition of glue to the liquor — about one-quarter to one-fifth of the weight of the dyestuff — will have a similar effect.

DYEING DIRECTIONS FOR IMMEDIAL COLOURS.

Name of
the Colour

Dyeing Directions for loose Cotton, Yarns and Fabrics.
(The percentages are reckoned on the weight of the dry materials; the weights of soda and salt are to be understood per 10 gallons liquor.)

Claret and
Maroon:
Immedial
Bordeaux
G conc.
GF conc.
Immedial Maroon
B conc.

	Dyestuff	Sodium Sulphide Cryst.	Soda Ash	Desiccated Glauber's Salt or Common Salt
For light shades:				
Starting bath:	1—4%	4—6%	3—4 oz per 10 gall.	0—8 oz per 10 gall.
For subsequent lots:	0.75—2%	2—3%	0.1—0.2%	—
For medium and deep shades:				
Starting bath:	4—20%	6—20%	4—8 oz per 10 gall.	1½—2 lbs per 10 gall.
For subsequent lots:	2—10%	2—10%	0.2—0.5%	0—5%

In order to obtain the brightest possible dyeings, dye to best advantage at 50—60° C. (120—140° F.), squeeze off in the case of hanks and piece-goods, and rinse; loose cotton is allowed to drain, or whizzed, and then rinsed. A little acetic acid is added to the last rinsing bath.

The brightness of the dyeings is enhanced by adding a little glue to the liquor — about one-fifth to one-quarter of the weight of the dyestuff.

When used in combination with brown or other Immedial Colours, the products may be dyed very well in hotter baths (near the boiling temperature).

Violet
and Purple:

Immedial Indone
Violet B conc.

is dyed exactly in accordance with the directions for the Immedial Indones on page 27.

Immedial Violet
C
CB
CR
Immedial Purple
C

are dyed like Immedial Bordeaux and Immedial Maroon, the soda and salt being however to best advantage omitted. An addition of glue does not offer any advantage for these dyestuffs.

AFTEERTREATMENT OF THE IMMEDIAL COLOURS.

I. AFTEERTREATMENT WITH METALLIC SALTS.

a) AFTEERTREATMENT WITH BICHROME:

This aftertreatment improves the shade in certain cases, especially with Blue and Black, and prevents light shades from changing by a subsequent oxidation.

The following quantities are as a rule employed:

3% bichrome and 3—5% acetic acid of 8° Tw.*

The dyed and well rinsed cotton is aftertreated hot for 20 to 30 minutes, and then rinsed again.

b) AFTEERTREATMENT WITH BICHROME AND SULPHATE OF COPPER:

This aftertreatment increases the fastness to light, washing and boiling of most colours, and raises the shade of a great many, especially those of Immedial Direct Blue, Immedial Blue and Immedial New Blue. It also prevents the dyeings from changing by a subsequent oxidation.

The following quantities are as a rule used, viz:

1.5—2% bichrome, 1.5—2% copper sulphate and 3—5% acetic acid,* the method of working being the same as described under (a).

c) AFTEERTREATMENT WITH BICHROME AND BISULPHITE:

This aftertreatment increases the brightness of the blue Immedial Colours, especially of the Immedial Direct Blues, Immedial Blues and Immedial New Blue, offering also the advantage that it may be carried out in the cold bath.

The last rinsing bath is charged with

0.5—1% bichrome,

and this liquor allowed to react for a few minutes on the goods, whereupon

3—6 oz bisulphite of soda of 64° Tw. per 10 gallons liquor are added to the same bath, the goods being then treated for another 7 to 10 minutes, and rinsed once more.

d) AFTEERTREATMENT WITH NICKEL SULPHATE AND BICHROME:

This method of aftertreatment, for which we hold letters patent, enhances the fastness to light and washing, and increases the brightness of Immedial Direct Blue, Immedial Blue and Immedial New Blue. It is applied

* Instead of acetic acid, formic acid may be used.

principally as a substitute for the aftertreatment with bichrome and bluestone in iron apparatus, because copper salts affect the iron.

The following are about the quantities used when following this method:

1—2% nickel sulphate, 1—2% bichrome,
3—5% acetic acid 8° Tw.*

The dyed and well rinsed cotton is treated hot for 20 minutes, and rinsed well once more.

II. AFTERTREATMENT WITH ACETATE OR FORMATE OF SODA.

This treatment is applied principally for Blacks produced with Immedial Colours and as a final operation in those cases in which the goods are not finally given an alkaline brightening or softening.

This aftertreatment is particularly needed for all those black dyeings (with the exception of Indo Carbon) which are brightened with acid (for instance silk-scrooped). In this case the acetate or formate of soda is added straight to the acid brightening bath.

An aftertreatment of this kind is important also for warps in half-wool goods if the pieces are subsequently acid cross-dyed or stoved, or if cotton dyed black in this manner is woven up with wool which has been dyed acid or stoved. After the acid cross-dyeing and stoving, the goods must without fail be rinsed thoroughly and then treated again with acetate of soda.

For yarns to be cross-dyed or stoved, it is also well to aftertreat with bichrome in the usual way, after the dyeing and rinsing, and then to rinse with the addition of acetate of soda to the last rinsing bath.

The quantity of acetate of soda required depends on the water which is used (hard water requiring less than soft water), and the amount of acid in the goods.

As a rule, 5 oz—1 lb acetate or formate of soda is required per 10 gallons water, which is added to the last rinsing bath. Aftertreated shades are treated with the acetate or formate after the aftertreatment only.

If the yarns, warps or fabrics are sized or finished after the dyeing, without previous drying, the salts are added to the size or finish.

* Instead of acetic acid, formic acid may be used.

In many cases the acetate or formate of soda may be substituted entirely or in part by the cheaper soda.

III. AFTEERTREATMENT WITH IMMEDIAL DEVELOPER.

This developer replaces hydrogen peroxide and sodium peroxide used hitherto. It keeps very well, is very easy to apply, and serves for the following two purposes:

**a) FOR OXIDISING DYEINGS PRODUCED WITH IMMEDIAL
INDONE, IMMEDIAL INDOGENE OR IMMEDIAL DIRECT BLUE.**

These shades oxidise more quickly and gain in brightness by rinsing with a slight amount of Immedial Developer.

The cotton is dyed in the customary manner, and rinsed. The last rinsing bath is heated to 40—50° C. (105—120° F.) and charged with 0.5—1% Immedial Developer (of the weight of the goods) whilst stirring. The cotton is treated in this bath for 20 minutes, and may then as a rule be freed from water at once, and dried.

This treatment is particularly of advantage for dyeing in apparatus.

**b) FOR DEVELOPING DYEINGS OF IMMEDIAL BLUE
AND IMMEDIAL NEW BLUE.**

This method of developing yields the same brightness of shade as is ensured by the older methods of developing by smothering and steaming described below. The latter is however the cheaper method, but the developing may also be effected with Immedial Developer. The developing with Immedial Developer is more advantageous than that with peroxide of hydrogen or sodium which is applied occasionally for the same purpose.

Dye the cotton in the usual way, and rinse immediately. Stir 1—2% Immedial Developer (of the weight of the goods) into the last rinsing bath heated to 40—50° C. (105—120° F.), then enter the goods, raise gradually to the boil, working about $\frac{1}{2}$ hour in all. Finally rinse once more.

IV. DEVELOPING OF IMMEDIAL BLUE AND IMMEDIAL NEW BLUE BY STEAMING, SMOTHERING OR TOPPING IN THE VAT.

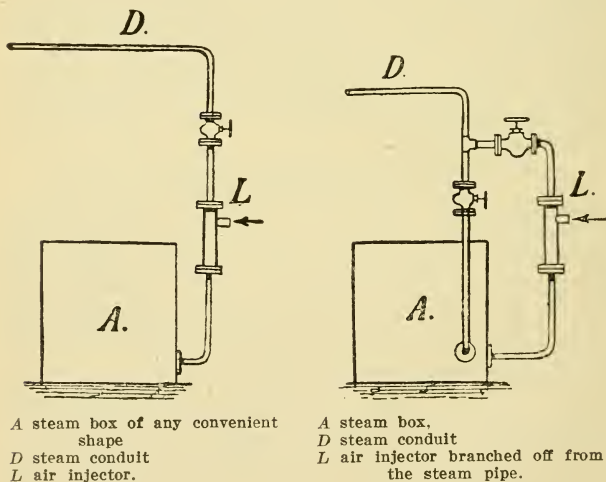
a) DEVELOPING BY STEAMING:

After dyeing (see pages 30 and 31), the goods are whizzed without previous rinsing, wrung, squeezed off,

and steamed; when dyeing in apparatus the liquor is drawn off well by suction or pressed off before the steaming.

The steaming may be carried out in any kind of box made of wood, copper or iron, or just as well in a dyeing machine or an ordinary dye vessel.

To effect an even distribution of the steam in the goods, it is best to suspend yarns and pieces on laths in the steam box, whilst loose cotton or warps are piled up in layers of a moderate height. The steam chest remains closed during the steaming operation. If the box is constructed of wood, the lid should be lined with felt or cloth in order to form a better closure.



The steam is best introduced at the lower part of the box in order to allow the condensed water to run off freely, and care altogether must be taken generally to prevent any condensed liquid from spotting the goods.

Wet steam may be rendered more serviceable by introducing along the bottom of the box a gilled steam-pipe for heating it previous to introducing the goods.

The hotter and drier the steam, the more rapid will be the developing and the brighter the shade of the blue.

Air is also admitted into the steam-box simultaneously with the steam by means of a small injector inserted into the steam-pipe (see sketch I on the opposite page).

The first sketch illustrates the steaming arrangement of a box used for steaming only. For vessels used also for dyeing, without disturbing the existing arrangement of the steam-pipes, an arrangement shown in sketch II is used which allows of the introduction either of steam alone or of steam and air simultaneously.

After steaming, the goods are rinsed in hot water, and soaped if necessary.

b) DEVELOPING BY SMOTHERING.

The dyed and hydroextracted or squeezed off cotton (loose cotton, yarn or piece-goods), without rinsing and whilst still warm, is put into skeps or wooden boxes lined with oiled brown paper or oil cloth (American cloth); these receptacles are then covered up to prevent a cooling or drying of the contents, and placed for a few hours or overnight in the drying room.

The developing of the blue in this way is best carried out by maintaining the temperature of the drying room at 60—70° C. (140—160° F.).

Piece-goods and warps may be smothered also in the ordinary dyers' barrow, but care must be taken to place them in such a way that they do not dry against the sides and that they retain their heat for a few hours.

After lifting, the cotton is rinsed in hot water, and may also be soaped.

c) DEVELOPING BY TOPPING IN THE INDIGO VAT.

The dyeings of Immedial Blue and Immedial New Blue may be developed also by topping in the Indigo vat, the reducing action of the vat also producing a brighter shade of the blue.

DIAMINE COLOURS AND BASIC COLOURS SUITABLE FOR SHADING IN THE IMMEDIAL COLOUR BATH.

Some of the Diamine and Basic Colours may be used for shading in the Immedial Colour bath, for instance the following:

Diamine Fast Yellow B
 Diamine Orange B
 Diamine Red 4B
 Diamine Fast Scarlet 4BFF
 Diamin Brilliant Scarlet S
 Diamine Violet Red
 Oxy Diamine Orange G, R
 Safranine, all brands
 Tannin Heliotrope.

These products have the property of dyeing well and evenly in a bath containing sodium sulphide, but a boiling bath must be avoided except in the case of Diamine Fast Yellow B and Diamine Orange B.

DYEING OF DIAMINE AND IMMEDIAL COLOURS IN A COLD OR LUKEWARM BATH.

Any of the Diamine or Immedial Colours may be dyed in a cold or lukewarm bath; full shades require rather more dyestuff than would be necessary in the hot starting bath. Particularly well suited are the following brands, some of which dye equally well in a cold or hot bath:

a) DIAMINE COLOURS WHICH MAY BE DYED IN A COLD OR LUKEWARM BATH:

Diamine Fast Yellow A,	Diamine Fast Violet
Diamine Yellow CP [AGG	FFBN, FFRN
Thioflavine S	Diamine Brilliant Violet
Oxy Diamine Yellow GG, TZ	B, RR
Diamine Orange G, D	Diamine Sky Blue, FF,
Diamine Fast Orange	FFN, FFS
EG, ER	Diamine Pure Blue A
Oxy Diamine Orange R	Diamine Blue 2B, 3B, BX
Diamine Rose, all brands	Diamine Azo Blue 2R
Diamine Purpurine 6B	Diamine Heliotrope B, O
Diamine Violet Red	Diamine Fast Grey BN
Diamine Red 10B	Diamine Black BH, DN
Diamine Brown M, S	Diaminogene B.
Diamine Nitrazol Brown G	

Dye cold in the usual manner with the addition of $\frac{3}{8}$ — $\frac{3}{4}$ oz soda ash and in the case of deep shades also of $\frac{1}{2}$ —3 lbs Glauber's salt or common salt per 10 gallons. For subsequent lots, about one-third to one-half the dyestuff and one-quarter to one-fifth the amount of soda and Glauber's salt as for the starting bath are added.

For *Black*, *Diamine Black BH*, *DN* and *Diaminogene B* are diazotised, and developed with Phenylene Diamine, alone or in combination with Resorcine, or Beta Naphtol.

b) IMMEDIAL COLOURS WHICH MAY BE DYED IN A COLD OR LUKEWARM BATH:

Immedial Indone 4B	conc.	Immedial Deep Green G
3B	conc.	Immedial Olive 3G, GG
BBF	conc.	Immedial Yellow Olive
BF	conc.	G, 5G
BN	conc.	Immedial Cutch O, R, BG,
JBN	conc.	BGG
JBF	conc.	Immedial Brown BR, BRS
R	conc.	Immedial Red Brown 3R
RG	conc.	Immedial Maroon B conc.
RR	conc.	Immedial Bordeaux
Immedial Indone Violet		G conc., GF conc.
B	conc.	Immedial Violet CB
Immedial Indone GCL	conc.	Immedial Black V extra
BCL	conc.	FF extra
RCL	conc.	NNG conc.
RRCL	conc.	NBB conc.
Immedial Deep Blue J		Immedial Brilliant Black
Immedial Green Blue CV		5BV conc.
Immedial Brilliant Green		Immedial Carbon B, BL
G extra		Immedial Brilliant Carbon
Immedial Green GG extra		F, FG.

These brands are dyed cold according to the general directions; in the case of Black the starting bath should be charged with about half as much again of dyestuff and sodium sulphide as usual.

In the case of *Immedial Indone*, *Immedial Dark Blue* and *Immedial Indogene*, somewhat more covered shades and a better exhaustion of the bath are obtained by adding about an equal amount of *Immedial Intensifier C* as of dyestuff. *Immedial Intensifier C* is best added in powder form to the ready bath shortly before entering the goods, whereupon the bath is stirred well.

HYDRON COLOURS.

Hydron Colours are dyed with the addition of hydrosulphite and caustic soda lye. Hydrosulphite serves the purpose of reducing the dyestuff, and the lye of dissolving the dyestuff in its reduced state. It is important therefore to have a sufficient amount of hydrosulphite and lye present in the dyeing in order to dissolve the dyestuff and to keep it in solution during the dyeing.

Vessels either of wood, copper, iron or nickeline may be used for the dyeing.

HYDRON BLUE G AND R POWDER, G AND R PASTE 20%.

These dyestuffs are distinguished for eminent fastness to washing, light, and chloring, and also resist bleaching in the piece very well (see page 45).

Preparation for the Dyeing. Hydron Blue being dyed at a moderate temperature, it is necessary to wet or boil the goods well before the dyeing. In the case of light Blues, the goods should also be bleached.

DYEING IN ABOUT 20 TIMES THE WEIGHT OF LIQUOR AS OF GOODS.

HYDRON BLUE G POWDER AND R POWDER.

<u>For light and medium shades:</u>	Starting bath:	Subsequent lots:
Dyestuff	0.4— 3 %	0.4— 2.4 %
Hydrosulphite conc. powder	2 — 7.5 %	2 — 6 %
Caustic soda lye 77° Tw.	2 — 7.5 %	2 — 4 %
<u>For deep shades:</u>	Starting bath:	Subsequent lots:
Dyestuff	4 — 6 %	3 — 4.4 %
Hydrosulphite conc. powder	10 — 15 %	7.5—11 %
Caustic soda lye 77° Tw.	10 — 15 %	6 — 8 %

HYDRON BLUE G AND R PASTE 20%.

For light and medium shades:	Starting bath:	Subsequent lots:
Dyestuff	2—15 %	2 —12%
Hydrosulphite conc. powder	2— 7.5%	2 — 6%
Caustic soda lye 77° Tw.	2— 7.5%	2 — 4%
For deep shades:	Starting bath:	Subsequent lots:
Dyestuff	20—30 %	15 —22%
Hydrosulphite conc. powder	10—15 %	7.5—11%
Caustic soda lye 77° Tw.	10—15 %	6 — 8%

The amount of hydrosulphite varies with the method of working, and in many cases a smaller quantity may be used. As a guide it may be mentioned that the bath must be of a light yellow colour.

An addition of Turkey-red oil or Monosolvol will retard the absorption and thus effect a better penetration in the case of hard-twisted yarns and tightly woven piece-goods, etc.

The caustic soda lye and the dyestuff are added to the bath at a temperature of about 50—60° C. (120—140° F.), and the hydrosulphite is then stirred in slowly in powder form or better still previously dissolved in cold water, the bath being stirred well until the liquor has assumed a completely yellow colour. The dyeing is then done at 50—60° C. (120—140° F.) for $\frac{1}{2}$ to 1 hour.

For particulars of reducing the powder product to a paste see page 4.

Loose Cotton is worked in the usual way during the dyeing, then thrown into baskets, whizzed if possible, left lying for some time exposed to the air in order to oxidise, and finally rinsed thoroughly.

Hanks are best dyed on bent sticks, then squeezed or wrung off, hung up in the air, and rinsed. Straight sticks may likewise be used for the dyeing, but in such case it is advisable to somewhat increase the amount of reducing agent and to turn the yarn more frequently or submerge it.

Piece-Goods are dyed in the jigger, padding machine or continuous dyeing machine, the goods after an even squeezing off being given a short air passage and finally rinsed warm. Further particulars are to be found in the chapter on the "Dyeing of Piece-Goods".

During the dyeing the liquor should be well reduced and have a light yellow colour, and the portions of the goods showing above the surface of the liquor during the turning must have a light yellow, but not a blue or green, colour. If the latter is the case, the bath contains an insufficient amount of reducing or dissolving agent, so some hydrosulphite and possibly some caustic soda lye should then be added.

For particulars for the dyeing in *mechanical apparatus* and *warp-dyeing machines* see the chapters on these subjects.

AFTERTREATMENT AFTER DYEING AND RINSING.

1. TREATMENT WITH PERBORATE.

Aftertreatment with perborate may be applied for the following two purposes:

a) To accelerate the oxidation, instead of airing, particularly also when dyeing in machines of the packing type.

About $\frac{1}{2}$ —1% perborate of soda is added to the last rinsing bath, to best advantage in two lots, the temperature is raised to 40—45° C. (105—115° F.), and the perborate allowed to act for 15 or 20 minutes.

b) To obtain considerably brighter dyeings. After rinsing, 1—2% perborate is added to a bath of 40—50° C. (105—120° F.), the temperature raised gradually to the boil, and the goods are treated for about $\frac{1}{2}$ hour in all; hereafter they are rinsed again.

2. TREATMENT WITH BICHROME AND ACETIC ACID.

This treatment effects a quicker oxidation, particularly also when dyeing in apparatus of the packing type.

First add 3—5% acetic acid to the cold to warm bath, and then 2—3% bichrome, allow to act for 10 or 15 minutes, and then rinse well again.

3. TREATMENT WITH BICHROME AND BISULPHITE.

The same effect is obtained with this treatment as with bichrome and acetic acid, the action being however somewhat more energetic. After rinsing, add $\frac{1}{2}$ —1% bichrome to the cold to warm bath, allow to act for a few minutes, then add 3—6 oz bisulphite to the same bath per 10 gallons, treat for a few minutes longer, and rinse well.

4. TREATMENT WITH COPPER SULPHATE.

By an aftertreatment in a hot bath with 3—4% copper sulphate and 3—5% acetic acid, the fastness to boiling and light, which already is excellent, is still further improved. The goods are treated in this way for 20 or 30 minutes, and then rinsed thoroughly.

COMBINATIONS OF HYDRON BLUES WITH OTHER DYESTUFFS.**a) INDIGO AND OTHER VAT COLOURS**

may be dyed together in the same bath with Hydron Blue according to the directions for Hydron Blue. All that has to be observed is that some of the vat colours require more hydrosulphite and caustic soda, and that the quantities of these ingredients have to be increased accordingly.

Combinations with a large amount of Indigo are dyed to advantage at a reduced temperature, say, about 40° C. (105° F.), and it has to be taken into consideration that three-quarters to four-fifths of the Indigo remain behind in the bath, while the Hydron Blue on the other hand is nearly exhausted.

Hydron Blue may likewise be applied as a bottom, the goods being topped with Indigo in any kind of Indigo vat in the customary manner.

b) DIAMINE, IMMEDIAL AND BASIC COLOURS.

These dyestuffs when dyed in combination with Hydron Blue are best used by topping the goods previously dyed with Hydron Blue in accordance with the above directions.

The *Diamine Colours* are in such case applied either in the usual manner (page 5), or, when only slight quantities are required, added to the last rinsing bath or to a hot soap bath.

The *Immedial Colours* are applied in the sodium sulphide bath according to the usual directions (pages 25—34).

The topping with *Basic Colours* is done in the same way as on Diamine and Immedial Colours (page 51).

The Immedial Colours may be added to the Hydron Blue bath, but to better advantage the topping is carried out in the sodium sulphide bath subsequently.

BLEACHING OF PIECE-GOODS CONTAINING YARN DYED WITH HYDRON BLUE.

In the case of piece-goods containing white threads contiguous to coloured ones, it is customary in by far the most cases to bleach the white yarn before the weaving. If a particularly good white is wanted, the pieces are then washed after the weaving and passed through a short, weak chlorine bath, a process which a number of the Diamine and Immedial Colours will withstand.

For certain styles, unbleached yarn is woven up with dyed yarn and then bleached in the piece. It is a well-known fact that only few dyestuffs will withstand this operation, and even then special precautions have to be taken in bleaching. The Hydron Blues are very well suited for this purpose. The pieces containing yarn dyed with Hydron Blue are bleached in the following manner:

Boil the pieces for about 1 hour in a jigger with 6—8 oz Turkey-red oil or Monosolvol per 10 gallons, and rinse; then bleach for a few hours with hypochlorite of soda of $\frac{3}{4}$ —1° Tw. in the customary manner, rinse once or twice, and sour off for 20 to 30 minutes in hydrochloric acid of $\frac{1}{2}$ ° Tw.

Hereafter enter into a fresh bath containing $\frac{3}{4}$ —1½ oz sodium bisulphite per 10 gallons, allow this to react for 15 to 20 minutes, rinse thoroughly, and finally soap if necessary.

Particulars for producing hypochlorite of soda will be found in the appendix.

BASIC COLOURS.

For particulars of dissolving Basic Colours see page 4.

Dyeing. In order to ensure a proper fixing of the Basic Colours on the cotton fibre, the cotton has to be mordanted previously.

The mordanting is generally carried out by treating the cotton with tannins and subsequently fixing with antimony salts.

The *tannin* usually employed is tannic acid, which is the purest and the least coloured of all tannins, and which yields the brightest shades. Of the other tannins, sumac is used principally either as leaves or in form of extract, mainly for dark shades, where its yellowish tone does not have a detrimental effect.

Antimony Salts. Various salts of antimony are used, such as tartar emetic, antimony salts, antimonine, etc. For the requisite quantities see page 49.

Of other fixing agents, iron salts come into consideration for dark shades, particularly copperas and pyrolignite of iron, because in using them a considerable saddening is at the same time attained, varying with the quantity of tannic acid used.

The colours fixed with iron salts do not possess the same degree of fastness to washing and light as those fixed with antimony salts. Frequently therefore the dyeings are fixed with antimony salts and then for saddening passed either before or after the dyeing through a bath charged with iron salts.

Blue:

New Methylene Blue N, NX, R, 3R, GB, GG
New Methylene Blue NSS and NSSF (free from zinc)
Methylene Blue BB
Methylene Blue DBB (free from zinc)
New Blue R, D 120, D paste, B, BF, FL, G, L,
R crystals, R paste, WW, extra F, No 7556
Neutral Blue
Indazine M
Naphtindone BB, BB paste, BR, T
Methylindone B, R
Metaphenylene Blue B, BB, BBR, R.

Violet:

Methyl Violet B, BB 72, 6B
 Crystal Violet 5B bluish, 10B
 Fast Neutral Violet B Powder and Paste
 Neutral Violet extra
 Tannin Heliotrope.

Green:

Solid Green crystals O, crystals OO, crystals A
 No 1 extra J, 4B
 Brilliant Green crystals extra, crystals A No 1
 Malachite Green conc.

Yellow and Orange:

Thioflavine T, TCN
 Aniline Yellow, extra
 Diamond Phosphine D, GG, PG, R
 Paraphosphine G, GG, R, L, P, AGE
 New Phosphine G
 Phosphine Ia, IIa, extra, EFF
 Tannin Orange R Paste, R Powder, GG
 Chrysoidine crystals, cryst. AG, cryst. R, Powder,
 AG, FN, FNA.

Red:

Magenta Ia. Dia. small and large crystals
 Cerise Ia, N
 Geranium GN
 Russian Red B, G
 Aniline Brown (Maroon)
 Safranine B extra O, G extra O, GG extra O, BS,
 B 400, GGS, B No 140, G No 140, S No 150, SP
 Scarlet for Cotton
 Neutral Red extra
 Irisamine G, G extra
 Rosazeïne 6B.

Brown:

Bismarck Brown No 259, EE, F, FF, FFG, GG, PS,
 Leather Brown A, B [PSE
 Nut Brown A.

Black:

Jute Black GN, 8174, 9375, 09624
 Black for Artificial Silk B, G, BN, GN, GNB, TN.

DIRECTIONS FOR DYEING BASIC COLOURS.

When producing bright colours, the goods are bleached first, but for darker shades they need only be boiled beforehand. The mordanting and dyeing operations are best carried out in wooden vessels (barks, jiggers, padding machines, etc.); iron vessels should be avoided owing to their tendency to dull the colours. For the same reason, water as free from iron as possible should be employed; if such is not available, a few drops of hydrochloric acid added to the mordanting liquor will have a very good effect.

DYEING ON A TANNIN MORDANT.

1. MORDANTING WITH TANNIC ACID.

Mordant

light	shades with	1—2%	tannic acid
medium	„ „	3—4%	„ „
deep	„ „	5—6%	„ „

lukewarm or hot for 2 to 3 hours, or in the case of deep shades overnight.

The baths exhaust but incompletely, and those for deep shades are therefore used for mordanting further lots, being replenished with about 3—4% tannic acid for each fresh lot. In order to exhaust the baths as far as possible, it is an advantage to enter the goods hot, allowing them however to cool in the bath because the tannic acid goes best on to the fibre at a temperature of about 60° C. (140° F.).

In the same way as pure tannic acid, other tannins such as sumac may be used, of which larger quantities however will be required.

The percentage of tannic acid contained in sumac leaves or sumac extracts varies very much, but it may generally be assumed that of sumac leaves 4 to 5 times, and of the extracts 2 to 3 times, the quantity of good, pure tannin is required.

2. FIXING WITH TARTAR EMETIC OR OTHER ANTIMONY SALTS.

About one-half the quantity of tartar emetic is required as of tannic acid, and somewhat less* of most of

* 10 parts tartar emetic correspond to about 9 parts antimony salts, 6½ parts double antimony fluoride, 6 parts Patent Salt, and 10 parts antimony potassium oxalate, antimonine or lactate of antimony. Antimony salts, double antimony fluoride and Patent Salt are used together with 6—8% of their weight of soda ash; antimonine and lactate of antimony, on the other hand are applied with the addition of 1½ pints acetic acid of 8° Tw. per 100 gallons liquor.

the substitutes for tartar emetic; the goods previously mordanted, whizzed or pressed off are treated cold for $\frac{1}{4}$ to $\frac{1}{2}$ hour, and then rinsed.

When treating further lots, the antimony baths are replenished with two-thirds to three-quarters of the quantities used for the first bath.

A prolonged exposure to the air causes the mordanted cotton to assume a brownish colour on the surface, and such discoloured parts will yield duller shades. If the mordanted goods cannot be dyed the same day, they are best covered over with a wet cloth after the mordanting and fixing.

2a) FIXING WITH IRON SALTS.

This operation is generally carried out in

a liquor of pyrolignite of iron of 3—4½° Tw., or in a liquor containing 5—10% copperas, of the weight of the cotton,

the goods being worked cold for $\frac{1}{4}$ to $\frac{1}{2}$ hour, and rinsed.

The fixing may also be carried out first with antimony salts, and a treatment with iron salts may follow for saddening, or the saddening with iron salts may be effected after the dyeing.

3. DYEING.

The cold dyebath is charged with 2—5% acetic acid or alum: the goods, which are rinsed very well after the mordanting and fixing, are entered, the dissolved dyestuff being added carefully in two or three portions and care being taken that the bath is exhausted before adding any fresh portion. The bath is then heated gradually to 60—70° C. (140—160° F.) and the dyeing continued for some time. Finally the goods are rinsed well.

Naphtindone is dyed in the same manner with the addition of rather more alum (5—8%) or of 3—5% sulphate of alumina, the dyeing being continued for another 20 to 30 minutes at the boiling temperature after the exhaustion of the bath.

4. MORDANTING AFTER THE DYEING.

In order to enhance the fastness, and particularly the fastness to acid boiling, the goods, after dyeing, are taken once more through the old mordanting baths which for this purpose are replenished with about half the quantities used for the starting baths; the goods are worked first in the tannin and then in the antimony bath for $\frac{1}{2}$ to 1 hour, and rinsed.

DYEING ON A TURKEY-RED OIL MORDANT.

This method serves for the production of very bright pink shades on cotton yarn with Irisamine or Rosazeïne.

The yarn is impregnated in lots of one pound each in a liquor consisting of 1 part Turkey-red oil and 2 parts water; it is then evenly dried, and mordanted once or twice again in the same way. After each pound of cotton the liquor is freshened up with 1 quart of a mixture of 1 part oil and 2 parts water.

Occasionally, the goods, after the impregnating with Turkey-red oil, are mordanted also with acetate of alumina (of about 5° Tw.), then wrung off or hydroextracted, and also dried. More bluish shades are obtained in this manner.

Dye in a short, cold bath with the addition of a little acetic acid, and dry at a moderate temperature.

TOPPING DYED COTTON WITH BASIC COLOURS.

Basic Colours are used frequently for shading other colours by topping, and for brightening.

The cotton, dyed in the customary manner and rinsed, is given a few turns in a cold bath charged with 3—5% acetic acid or 3—6% alum; the well dissolved Basic Colour is then added in several portions, and after exhaustion of the portion last added the bath is heated to 60—80° C. (140—175° F.).

If but very slight quantities of a Basic Colour are to be used for topping dyeings fast to soaping, this operation may be carried out also in the soap bath. Methylene Blue, Safranine and Thioflavine are products especially well suited for this purpose.

DIRECT DYEINGS WITH BASIC COLOURS.

Certain of the Basic Colours, particularly Naphtindone, may like the Diamine Colours be dyed in a salt bath.

Naphtindone BB is then dyed with 3—3.5 lbs common salt or desiccated Glauber's salt per 10 gallons; enter the cotton at 40—50° C. (105—120° F.), heat to the boil, and rinse.

ACID COLOURS.

(SCARLET, EOSINE, WATER BLUE, INDULINE).

Acid Colours as applied for cotton are used mainly for producing bright shades not calling for special fastness to washing.

Scarlet:

Brilliant Croceïne M, R, B to 9B
Scarlet FR, FRR, FRRR
Croceïne AZ.

Of these products, the Croceïnes are of special importance, as they yield bright scarlets of excellent fastness to light.

Directions for Dyeing.

Dye in as short a liquor as possible containing in addition to the dyestuff about

4½ oz alum and	{	per 10 gallons liquor.
2 lbs Glauber's salt		

The quantity of dyestuff is dependent on the depth of shade required: the bath should be charged with considerably larger quantities of ingredients than the subsequent baths; for instance:

Starting bath:		Subsequent baths:
For dark shades	10%	2 % dyestuff
for light shades	3%	0.5% dyestuff.

Enter the cotton into the bath heated to 50—70° C. (120—160° F.), and dye in the cooling bath. Then wring or squeeze off evenly (whizz in the case of loose cotton), and dry at a moderate temperature without rinsing.

Eosines:

Eosine 3G, GGF, BN
Eosine Scarlet B
Erythrosine yellow shade, extra N, B, D
Phloxine (749), S
Rose Bengale extra N
Rosazeïne B.

These dyestuffs yield still brighter shades than the Croceïnes, but are inferior in fastness to light.

Directions for Dyeing.

Dye for $\frac{1}{2}$ to $\frac{3}{4}$ hour at 30—40° C. (85—105° F.) in as short a liquor as possible with the addition of common salt, wring or squeeze off evenly (or whizz in the case of loose cotton), and dry at a moderate temperature without rinsing.

EXAMPLE:

For 100 lbs cotton in about 120—140 gallons liquor, the baths are charged with

	Starting bath:	Subsequent lots:
Dyestuff	2— 8 lbs	$\frac{1}{2}$ — 2 lbs
Common salt	30—60 lbs	4—10 lbs

Rosazeïne may be dyed on yarn previously mordanted with Turkey-red oil as described on page 51, yielding in this manner exceedingly bright shades of Pink.

Water Blue and Indulines:

Water Blue B, RB, R
 Pure soluble Blue
 Methyl Blue for cotton
 Blue JBP, JB, BS, FS, RS, RRS
 Alkaline Blue RRR to 6B
 Induline B, 2B, 3B
 Solid Blue BD, BBD, R, 3R
 Aniline Grey B, R
 Silver Grey N
 Aniline Grey B, R
 Nigrosine soluble in water.

Directions for Dyeing.

1. DIRECT DYEING WITH ALUM AND GLAUBER'S SALT.

The process is the same as described on page 52 for Croceïne, except that only about one-half the quantity of dyestuff is required. The weights of alum and Glauber's salt remain the same.

2. ON A TANNIN MORDANT.

The process is exactly the same as given for the Basic Colours; very bright shades are thereby obtained, which are somewhat faster to washing than those produced by Method 1, but no special fastness to washing can be claimed for such dyeings.

The Alkaline Blue brands in particular are dyed according to this second method.

ISAMINE BLUE 8B, 6B, B and R.

Isamine Blue is dyed for about $\frac{1}{2}$ to 1 hour in a hot bath with the addition of 1—3 lbs cryst. Glauber's salt and $1\frac{1}{2}$ —3 oz acetic acid per 10 gallons liquor, according to the depth of shade required.

If, after dyeing, the goods are rinsed in calcareous water, a little acetic acid should be added thereto.

The dyebaths do not exhaust in the case of Isamine Blue, so that with an ordinary volume of liquor of about 20 times the weight of the material to be dyed, only about one-half to two-thirds of the original quantity of dyestuff used is added to the standing bath.

PARANITRANILINE RED.

Paranitraniline Red is not dyed like an ordinary dyestuff, but is produced directly on the fibre. To this end the goods are impregnated with Beta Naphtol and then treated with diazotised Paranitraniline. Diazotised Paranitraniline is either prepared afresh, or the commercial *Nitrazol C* is used in its stead. Nitrazol C represents the ready, stable, diazotised Paranitraniline, the application of which simplifies its preparation.

Paranitraniline Red possesses very good fastness to washing and light, and is for this reason and owing to the simpler method of production employed frequently as a substitute for Turkey Red on cotton piece-goods and cotton hank yarn.

It is however not very well suited for loose cotton or for machine-dyeing.

The directions for dyeing Paranitraniline Red will be found in the respective chapters dealing with the dyeing of cotton yarn and piece-goods.

DYEING OF LOOSE COTTON
AND COTTON YARN
INCLUDING MERCERISED COTTON YARN

The dyestuffs used for producing the individual shades on loose cotton and cotton yarn are enumerated in the tables on pages 100—119.

DYEING OF LOOSE COTTON AND COTTON YARN IN OPEN VATS AND KETTLES.*

LOOSE COTTON.*

Preparatory Treatment. Loose cotton before dyeing is usually passed through the opener so that it may be better penetrated by the dye liquor and does not as a rule require further preparing. Wetting in hot water is but seldom required; being resorted to for instance when dyeing Basic or Hydron Colours at a low temperature, when it is useful to add some Turkey-red oil, Monosolvol or the like. For the production of very light or very bright shades the cotton is sometimes also bleached.

Bleaching. Bleaching loose cotton is seldom necessary. It is best carried out with hypochlorite of soda, which produces a good white and affects the material the least.

Boil the cotton for $\frac{1}{2}$ to 1 hour with 3—5% soda or Turkey-red oil or Monosolvol; then rinse, treat for 1 to 2 hours with a solution of hypochlorite of soda of $\frac{3}{4}$ —1 $\frac{1}{2}$ ⁰ Tw., working as usual, sour off for 20 to 30 minutes with hydrochloric acid of 0.2—0.5⁰ Tw. whilst turning well, and rinse once more thoroughly.

In order to ensure complete removal of the chlorine, the goods, after the souring off, are frequently given a bath of 1 $\frac{1}{2}$ —3 oz bisulphite per 10 gallons, or the bisulphite may also be added straight to the acid bath.

Particular care should be taken that the chlorine and acid are removed very thoroughly.

Small lots may best be bleached in the wooden bark; larger lots are mostly bleached in large cisterns or vats

* For particulars regarding the dyeing of loose cotton and cotton yarn in machines see the respective chapter.

in which the bleaching liquor is pumped over the cotton; or the bleaching is done in apparatus. See the directions in the chapter regarding "Machine Dyeing".

Dyeing. Any of the Diamine, Immedial, Hydron, Basic or Acid Colours enumerated in the general part may be used for the dyeing of loose cotton and be applied according to the methods stated there for this purpose.

The choice of dyestuffs and methods of dyeing is dependent on the shade to be produced and the demands made for fastness. For directions see the tables on pages 100—119.

DIAMINE COLOURS.

The Diamine Colours are dyed in *barks* or *kettles* made of wood or copper; for dark shades iron vessels may also be used.

The dyebaths are prepared as described in the general part on page 5 and following pages.

The dry and previously opened cotton is usually entered into the boiling dyebath, and dyed boiling for $\frac{1}{2}$ to 1 hour, being turned in the ordinary manner. It is best to use indirect steam for boiling, especially when producing full shades. In the case of deep shades, the cotton is allowed to feed in the cooling bath, being then thrown out and allowed to cool, or rinsed at once.

The dyed cotton should not remain in the dye liquor overnight or lie unrinsed for a prolonged time, because the shade is apt to become altered thereby.

When dyeing *deep shades*, it is essential for a thorough exhaustion to keep the bath as short as possible, using not more than a volume of liquor 20 to 25 times the weight of the cotton. The baths may be preserved for further lots, being then replenished with the quantities of dyestuff and salt indicated on page 6.

When dyeing *light shades*, there is no special limit for the volume of liquor, nor is the bath preserved for subsequent lots.

In dyeing pale and bright shades in copper vessels, the addition of soda to the dyebath is to advantage omitted.

Aftertreatment with Copper Sulphate and Chrome Salts.

The dyestuffs adapted for this purpose and the methods of aftertreatment to be followed are given on pages 10—12.

Dye the cotton as afore-described, then rinse lightly in the dye vessel, and aftertreat hot. In case the baths for the aftertreatment are to be preserved for further use, this operation is carried out in a special vessel, adding but two-thirds to one-half the quantities of metallic salts used for the first bath.

Diazotising and Developing. This operation is carried out in ordinary barks or to advantage also in the customary washing machine according to the directions on pages 13—16.

After dyeing, the cotton is rinsed cold. Nitrite and hydrochloric acid are then added to the last rinsing bath, the cotton being treated therein for about 15 minutes. This liquor is then run off, whereupon the goods are treated in fresh water acidulated with a little hydrochloric acid. After rinsing therein for a few minutes, this bath also is run off, fresh water run in and the cotton treated for 15 minutes with the addition of the developer; finally the cotton is rinsed well.

When using Beta Naphtol or Phenylene Diamine, the developing bath must show an alkaline reaction (that is to say, red litmus paper must be turned blue) even during the developing; if this is not the case, it must be rendered alkaline with soda.

Coupling with Nitrazol C or with Diazotised Paranitraniline C.

The coupling is likewise carried out in ordinary barks, or to good advantage also in the ordinary washing machine. The cotton is rinsed cold after dyeing, and entered into the cold coupling bath prepared as indicated on pages 17—19. The addition of soda and acetate of soda however is usually omitted in the case of loose cotton so that the coupling liquor may penetrate the cotton more gradually and more evenly; it is advisable also, when coupling large lots, to increase the quantity of the Nitrazol or Paranitraniline, and to add the same in two portions successively.

The cotton is turned well for $\frac{1}{2}$ to $\frac{3}{4}$ hour in the cold coupling bath. If the cotton is not turned well the coupling is apt to be incomplete in some parts and thus show uneven results.

After the coupling, the cotton is rinsed and dried, or softened before the drying.

The coupling bath is as a rule exhausted almost completely, and need not be preserved for further use.

Aftertreatment with Formaldehyde. The cotton dyed in the customary manner is rinsed, and treated in the bark or kettle for 20 to 30 minutes in a bath heated to 60—70° C. (140—160° F.) charged with 3% formaldehyde and 1—2% bichrome. It is then rinsed. (See also particulars on page 20.)

Aftertreatment with Chloride of Lime. The cotton is dyed direct with Primuline, and after rinsing treated for $\frac{1}{2}$ hour in a bark with a liquor containing a clear solution of chloride of lime of $\frac{3}{4}$ ° Tw., rinsed again, soured off with hydrochloric acid, and rinsed once more. (Page 21.)

IMMEDIAL COLOURS.

These are dyed, same as the Diamine Colours, in *barks* or *kettles*, which must not however contain any parts of copper or brass coming into contact with the liquor.

The *heating of the liquor* is best done with indirect steam, steam pipes made of iron or lead being used.

The dyebaths are prepared as described in the general part on pages 25—34.

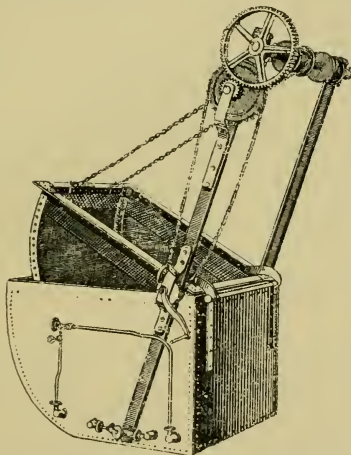
As a rule, the dry, previously opened cotton is entered into the boiling bath and turned well for 10 to 15 minutes at the boil. The dye vessel is then covered, so as to keep the cotton immersed in the liquor, dyeing being continued for another $\frac{1}{2}$ to $\frac{3}{4}$ hour. (When dyeing at a reduced temperature in order to produce brighter shades, the cotton should be previously boiled or wetted.) After dyeing, the cotton is thrown out on to a wooden lattice frame or into baskets so as to allow the adhering liquor to drain into the dyebath, and then rinsed. Or it is first whizzed, the waste liquor running off being returned to the bath. Iron hydroextractors are then used, or such made of copper laid out with cotton cloth, or better still tin-lined or enameled. If however the cotton is rinsed after dyeing, i. e. before the whizzing, ordinary copper hydroextractors may be used.

Same as with the Diamine Colours, it is of importance to keep the baths of the Immedial Colours as short as possible in order to ensure a good exhaustion. The dyeing is best done in a volume of liquor not exceeding

20—25 times the weight of the cotton. In the case of deep shades it is well to use the bath for dyeing subsequent lots, replenishing it with the quantities of dyestuff and other additions indicated on pages 25—34. In the case of light shades the volume of liquor is of less importance.

The first rinsing bath, in which is contained a good deal of dyestuff, may be used for replenishing the bath.

Immedial Colours may also be dyed in a dye vat* as per sketch below which contains an inner kettle by means



of which the loose cotton may be lifted out of the liquor in a simple manner.

Immedial Blue and *Immedial New Blue* are dyed somewhat differently, the cotton after the dyeing as a rule being whizzed, and, without rinsing, developed either by smothering or steaming; and after the developing, the cotton is rinsed hot. For detailed instructions regarding the different methods of developing see page 31.

Aftertreatment with Metallic Salts. This is carried out as per directions given on page 35, otherwise in the same manner as stated for Diamine Colours on page 59. There is no objection to the use of copper vessels or steam pipes in this operation.

* Built and sold by Ernst Gessner at Aue in Saxony.

Aftertreatment with Acetate or Formate of Soda. This operation, which is carried out as described on page 36, is of very great importance for all Immedial Black dyeings (with the exception of Indo Carbon) unless they are soaped, softened or otherwise subjected to an alkaline treatment.

HYDRON COLOURS.

The Hydron Colours are dyed in barks, or kettles exactly like the other colours; the dye vessels may consist of wood, copper, or iron.

The dyebaths are prepared as described in the general part on page 42 and following pages.

The Hydron Colours being dyed at a low temperature, it is well to previously wet the cotton with boiling hot water containing some Turkey-red oil or Monosolvol.

Dye loose cotton for $\frac{1}{2}$ to 1 hour, turning as usual; then throw out, allow to drain, or whizz if possible, and rinse. The shade gains in brightness if the cotton is left lying for several hours before the drying. The same effect is ensured by a treatment with bichrome and acetic acid, or bichrome and bisulphite, the greatest brightness being ensured by a treatment with perborate of soda as described on page 44.

BASIC COLOURS.

The *mordanting* of the cotton with tannic acid or sumac and tartar emetic is carried out in the customary manner according to the instructions given on pages 49 and 50. The loose cotton is to advantage wetted boiling hot before entering into the tannin bath, and then whizzed. For the mordanting and dyeing, iron vessels or iron steam pipes have a detrimental effect on the shades to be produced, and must therefore be avoided.

The *dyeing* is done in a cold to lukewarm bath with the addition of acetic acid by first adding the acetic acid to the cold bath, then the dyestuff in several portions, and finally heating the bath gradually.

The Basic Colours are frequently dyed also on a bottom produced with Diamine or Immedial Colours (see next page), a better penetration being ensured in this manner,

ACID COLOURS AND ISAMINE BLUE

are dyed as per instructions on pages 52 to 54. The cotton must be wetted hot first. After dyeing, the cotton is hydro-extracted and then dried without rinsing.

Isamine Blue is frequently also given a short rinsing before being finished in the customary manner.

BOTTOMING WITH DIAMINE, IMMEDIAL OR HYDRON COLOURS, AND TOPPING WITH BASIC COLOURS.

The bottoming is carried out with Diamine, Immedial or Hydron Colours as described above, the cotton being then rinsed. For the topping with Basic Colours, the cotton is then treated in a cold bath charged with the basic dye-stuff and some acetic acid, which may be heated towards the end of the operation to about 50° C. (120° F.). This treatment usually takes place in the washing machine.

BOTTOMING WITH DIAMINE COLOURS OR IMMEDIAL COLOURS, AND TOPPING WITH ONE-DIP ANILINE BLACK.

The various Oxy Diamine Blacks and Oxy Diamine Carbons, in particular Oxy Diamine Black JEI, JB, JW, Oxy Diamine Carbon JEI, JB, and also Diamineral Black, are used for bottoming; Cotton Red A is likewise frequently used for the same purpose. The various Immedial Black or Immedial Carbon brands are also topped with Aniline Black. The cotton is as a rule dyed with these dyestuffs the normal depth in the customary manner and then rinsed.

For topping, the cold bath, which should be kept as short as possible (a volume of liquor not more than 10 to 15 times the weight of the cotton), is charged with

- about 4—5% aniline salt,
- 6—7% hydrochloric acid of 32° Tw.,
- 3% sulphuric acid of 168° Tw., to which are added, before entering the material,
- 3% sulphate of copper and
- 4% bichrome.

Dye for 1 to 1½ hours in the cold bath, then heat in the course of about ½ hour to 50—60° C. (120—140° F.), rinse well, and soap hot, if necessary.

Should the black come out too greenish, some soda is added to the soap bath; if on the other hand it is too reddish, the goods, after soaping and rinsing, are soured off with 3—5% acetic acid.

SOFTENING LOOSE COTTON.

The object of this manipulation is to render the cotton more supple; it is resorted to especially with material to be used for the spinning of carded yarn.

The softening is prepared by boiling up

3 parts oleïne, 1 part soap and $\frac{1}{2}$ part ammonia liquor together in a cask, and adding a few pints to the liquor in which the cotton is to be treated.

COTTON YARN.*

Preparation of the Yarn. Previous to dyeing in the bark or vessel, the yarn is as a rule boiled, or at least well wetted. For the boiling, the yarn is placed hank by hank in barks or kettles of wood or iron, and boiled for some hours either open or under pressure; when using soft water about 3—5% soda ash, Turkey-red oil or Monosolvol or 2—3% caustic soda lye of 77° Tw., are added; after the boiling the goods are rinsed.

Care has to be taken in the boiling that the yarn is all the time well covered by the liquor, because the parts of the yarn remaining exposed to the air suffer in strength and cause uneven results in the dyeing.

A good and thorough boiling is of particular importance in the case of light shades and of shades which are dyed below the boil.

The *wetting*, which is used in place of the customary boiling, particularly in the case of dark shades, is done in a hot bath with the addition of Turkey-red oil or Monosolvol, and takes about 20 or 30 minutes. As a rule, 2—3% Turkey-red oil or Monosolvol, reckoned on the weight of the goods, are used for wetting.

Uneven results in the dyeing are apt to occur if the goods are left lying for a prolonged time between the boiling and the dyeing, and it is best therefore to boil or wet just as much yarn as is to be dyed the same day or the day following.

In the case of pale and bright shades, cotton yarn is frequently also bleached before the dyeing.

Bleaching. The bleaching is done almost invariably by treating the previously boiled yarn with chloride of lime or hypochlorite of soda.

The yarn is boiled for a few hours as given above, usually with pressure, then rinsed, and chlored.

* For particulars regarding the dyeing of cotton yarn in machines see the following chapter.

The chloring or bleaching with chloride of lime or hypochlorite of soda is frequently carried out in the same or similar barks as are used for dyeing, by working the yarn on sticks for several hours in solutions of $\frac{3}{4}$ — $1\frac{1}{2}^{\circ}$ Tw., rinsing, souring off for abt. $\frac{1}{2}$ hour in hydrochloric acid of 0.1 — 0.4° Tw., and rinsing again thoroughly; it is an advantage to soap hot finally.

The bleaching, especially when working with large lots, is sometimes also carried out by prolonged immersion (about 12 to 18 hours) in more dilute solutions of chloride of lime in large cisterns of cement or wood, the bleaching liquor being pumped over the yarn; the method of working is the same or similar as described in the chapter on "Machine-Dyeing".

Blueing for White. Bleached cotton always possesses a more or less yellowish tinge, and must be blued slightly, if perfectly clear white is required. Besides insoluble mineral colours, the various brands of New Methylene Blue, Methyl Violet, Water Blue, Azural Blue, etc. are frequently used for this purpose. Of late however Alizarine Cyanole EF, Alizarine Cyanole Violet R and Alizarine Brilliant Green G, alone or in combination, and depending on the particular shade desired, are very frequently employed for the same purpose.

To this end a stock solution is prepared of about 8 oz dyestuff per 10 gallons water as free from lime as possible, this solution being filtered and the requisite quantity added to the bath.

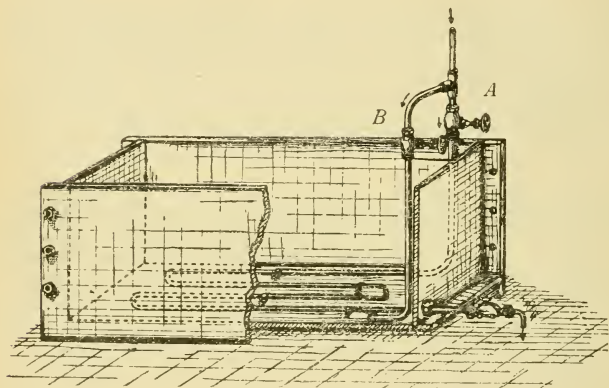
The tinting with Blue is done in the last rinsing bath, or, if the yarn is soaped subsequently, in the soap bath. If the yarn is sized, the Blue for tinting is added to the size.

Dyeing. Any of the Diamine, Immedial, Hydron, Basic or Acid Colours enumerated in the general part may be used for the dyeing of cotton yarn according to the methods of dyeing there indicated.

The selection of the dyestuffs and methods of dyeing varies with the shade to be produced and with the demands made regarding fastness. The necessary directions for doing so will be found in the tables on pages 100—119.

DIAMINE COLOURS.

The previously well boiled or bleached yarn is mostly dyed in vats or barks made of wood or copper. Indirect steam is to best advantage used for heating the liquor, for which purpose it is recommended to provide the dye vessels with a double set of pipes as illustrated in the following sketch.



A: closed, B: open steam pipe.

The open steam pipe B is used for heating the liquor more rapidly, whereas the closed pipe A is used during the dyeing for heating the liquor by indirect steam without diluting it by condensed water.

When dyeing *light shades*, it is best to work in a comparatively dilute liquor; the well boiled or bleached yarn is entered into the warm bath charged with little or no salt and only with some soda, Turkey-red oil or soap; for somewhat deeper shades the bath may be heated to 60—70° C. (140—160° F.), or even to boiling temperature. When dyeing light or brilliant shades in copper vessels this is best done without the addition of soda.

When dyeing *medium* or *deep shades*, the yarn is entered into the boiling dyebath, which should be as short as possible (not more than 18 to 20 times the weight of the cotton); it is dyed for $\frac{3}{4}$ to 1 hour at the boil, then being allowed to feed for some time in the cooling bath, and rinsed.

In the case of *deep* shades it is an advantage to use the dye liquor continuously for subsequent lots, replenishing it with the quantities of dyestuff and additions indicated on page 6. For *light* shades the dye liquors are prepared afresh for each lot, the colours becoming fairly well exhausted.

The dyeing and the various methods of aftertreatment, the diazotising and developing, and the coupling are carried out as described on page 58 for loose cotton, and according to the directions on page 5 and following pages.

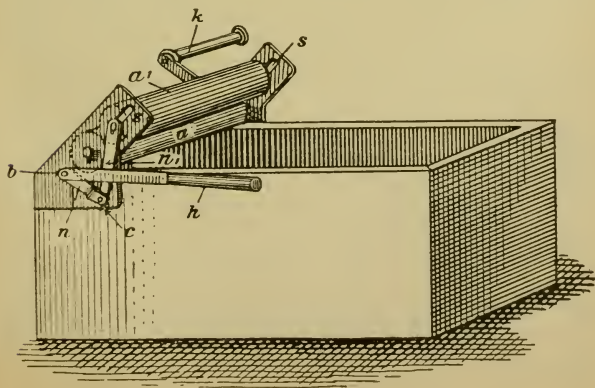
IMMEDIATE COLOURS.

These are dyed in vats or barks made of wood or iron of the kind used for Diamine Colours; the parts which come into contact with the dye liquor must not be of copper or brass. Here too it is recommended to heat the bath with indirect steam, same as suggested for the Diamine Colours. Steam pipes made of iron or lead are the best adapted for this purpose.

For the production of level dyeings it is of great importance that the hanks on being lifted out of the dyebath are squeezed off without delay.

The squeezing rollers used for this purpose are fixed on the front side of the bark, and the squeezing must be done as thoroughly and effectively as possible.

The following sketch shows an effective arrangement of the squeezing rollers:



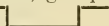
An iron cheek with bearings for the rollers (*a*) and (*a*₁) is fixed on each long side at one end of the bark, the bearings of the top roller being so adjusted as to move in slots (*s*) when the roller is lifted or lowered.

The top roller is raised and lowered by means of a lever arm (*h*) in connection with a knee-joint lever (*n*) and (*n*₁). The levers (*h*) and (*n*) are firmly joined at (*b*), whilst there is a moveable joint at (*c*) for the levers (*n*) and (*n*₁). A similar arrangement, but without the lever arm, is fitted to the other side for the equal raising and lowering of the top roller.

Both sides are connected by a shaft, passing through (*b*) right across the bark, by which the lifting and the lowering of the top roller proceeds simultaneously from both sides. The lower lever is provided with a crank (*k*).

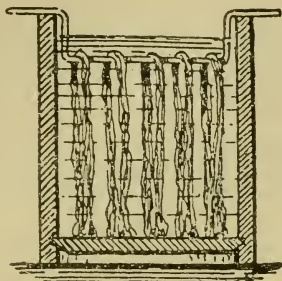
The method of working is as follows:

After completing the dyeing proper, the upper roller (*a*) is lifted by raising the lever (*h*), and the stick (which should as short as practicable) carrying the yarn is passed between the two rollers and the yarn laid upon the lower roller. While one man is pressing down the lever (*h*), another turns the crank (*k*) and the yarn thus passes between the rollers and is freed from the bulk of the adhering liquor.

If high demands with regard to levelness of the colours be made, the use of bent iron pipes is recommended. For this purpose, gas pipes of $\frac{3}{4}$ —1" diameter are bent to this shape , fitted exactly to the inner width of the vessels, strips of cotton cloth being wrapped round the part on which the yarn rests.

Instead the rods being wrapped round with cloth, they may, in order to prevent them from rusting, be rubbed each evening with a rag soaked with mineral oil, or washed each time after use in water containing some soda and then dried at once; the rods are best stored in a drying room or any other warm place.

The method of working with these rods is illustrated in the following sketch.



In place of bent iron rods, straight sticks also may be used; in such case it is however necessary to increase the quantity of sodium sulphide and to turn the yarn more frequently, or to immerse it. In the latter case it is best after entering to give the yarn 4 to 6 successive turns, immersing it then in the liquor, and giving another three turns during the next $\frac{3}{4}$ to 1 hour.

Before lifting, the hanks are given 2 to 3 successive turns, squeezed off stick by stick, and as a rule submersed in a rinsing bath kept ready to hand. The whole lot having been lifted in this manner, the rinsing is completed in the customary manner.

Light shades are dyed in a warm to hot bath, *medium and dark shades* mostly in a boiling bath.

Light shades are best dyed without any addition of salt whatever, the quantity of sodium sulphide being besides considerably increased in proportion to that necessary for the dyeing of medium and deep shades.

Full directions for dyeing are given in the general part on pages 25 to 34.

Immedial Blue and *Immedial New Blue* are frequently developed by steaming or by smothering.

For details regarding the various *methods of developing* see pages 35 to 39.

The *aftertreatment with metallic salts* for increasing the fastness is carried out in the well-known manner, and may be done without any risk in copper vessels. The dyed and well rinsed yarns are treated as per instructions on page 35 with bichrome or with copper sulphate and bichrome in the hot to boiling bath, and are then rinsed. The liquors may be used continuously, and are freshened up with $\frac{2}{3}$ — $\frac{1}{2}$ the quantities of salts used for the first bath.

The *treatment with acetate or formate of soda* is very important for black Immedial shades, those of Indocarbon excepted, and is carried out according the indications on page 36.

HYDRON COLOURS.

These colouring maters are dyed in the same wooden or copper vessels as the Diamine Colours; it is well to fix squeezing rollers to the vessels as shown on page 67.

The preparing of the dye liquors has been described in the general part on pages 42 et seq.

The previously well boiled yarn, which may also be bleached for light shades, is dyed for $\frac{1}{2}$ to 1 hour at 50—60° C. (120—140° F.), best on bent iron pipes as used for Immedial Colours.

The yarn may also be dyed on straight sticks, in which case it is recommended to increase the amount of hydro-sulphite and to turn more frequently. Or, instead of turning frequently, the yarn immediately after being given a few turns, is immersed in the liquor; it is then sufficient to give two more turns during the dyeing.

Before lifting, the yarn is turned 2 or 3 times, squeezed stick for stick, wrung off evenly, exposed to the air $\frac{1}{2}$ to 1 hour, and rinsed well.

Treatment after dyeing. The aftertreatment with perborate described on page 44 renders the dyed shades brighter. The fastness to light and to boiling is increased by an aftertreatment with blue vitriol according to the directions on page 45.

BASIC COLOURS.

The Basic Colours are dyed according to the directions on pages 47 to 51.

It is essential for the levelness of the shades that the yarn is mordanted in proportion to the depth of shade to be produced, but not too heavily so, and that the dyestuff is well dissolved and added to the bath gradually and in several portions.

Basic Colours are very frequently also dyed on a bottom of Diamine, Immedial or Hydron Colours for shading or brightening purposes, offering at the same time the advantage of a very simple method of application; particulars will be found in the note below on "Bottoming with Diamine, Immedial or Hydron Colours and Topping with Basic Colours".

ACID COLOURS AND ISAMINE BLUE.

The previously well boiled or bleached yarn is dyed as per the directions on pages 52 to 54. After dyeing, it is hydroextracted very evenly, or wrung off, and dried at a moderate temperature without rinsing.

The Isamine Blues after dyeing are frequently also given a short rinsing in a cold bath acidified with acetic acid, then whizzed and dried as usual.

BOTTOMING WITH DIAMINE, IMMEDIAL OR HYDRON COLOURS, AND TOPPING WITH BASIC COLOURS.

Dyeings produced with Diamine, Immedial or Hydron Colours are easily topped by turning the dyed and well rinsed yarn in a cold bath containing 3—5% acetic acid or 3—6% alum, then adding the well dissolved Basic Colour in several portions, and finally heating to about 60—80° C. (140—175° F.).

If very small quantities of Basic Colours are used for the topping of Immedial or Hydron Colours, this operation may also be carried out in a soap bath, Methylene Blue, Safranine and Thioflavine T and TCN being particularly well suited for this purpose.

BOTTOMING WITH DIAMINE OR IMMEDIAL COLOURS, AND TOPPING WITH ONE-DIP ANILINE BLACK.

The dyeing and topping is carried out in exactly the same manner as stated for loose cotton on page 63.

COMBINATIONS OF DIAMINE, IMMEDIAL AND BASIC COLOURS WITH INDIGO OR HYDRON BLUE.

a) TOPPING OF INDIGO OR HYDRON BLUE DYEINGS WITH OTHER DYESTUFFS.

Any of the Diamine, Immedial or Basic Colours may be used for this purpose.

The topping with Diamine Colours is carried out either by the usual method of dyeing in a salt bath, or, if very slight quantities only of topping colours are used, in the last rinsing bath or in a warm soap bath.

The topping with Immedial Colours is done in the normal manner in a sodium sulphide bath.

The topping with Basic Colours is carried out in the manner described on page 63 for loose cotton.

b) BOTTOMING WITH OTHER DYESTUFFS, AND TOPPING WITH INDIGO.

Diamine or Immedial Colours or Hydron Blue may be used for bottoming; the topping with Indigo may then be done in the various kinds of Indigo vats.

Of the Diamine Colours, the various brands of Diamineral Blue are used the most for bottoming, but of course all the other blue and blue-black Diamine Colours are also used to a large extent for such purpose.

Of the Immedial Colours, Immedial Direct Blue and Immedial Blue are employed principally; for very deep and dense Blues, Immedial Brilliant Black 5BV conc. and Immedial Brilliant Carbon F are used either alone or in combination with any of the blues mentioned above. It is unnecessary to specially develop Immedial Blue if it is to be topped subsequently with Indigo.

The yarn is dyed as customary, then rinsed, and topped at will with Indigo.

The Hydron Blues are dyed as per the directions on page 42.

c) DYEING IN THE INDIGO VAT.

The Hydron Blues may be dyed in combination with Indigo in one bath according to the directions on page 44.

PARANITRANILINE RED.

For the production of Paranitraniline Red as a substitute for Turkey-red, either *Paranitraniline C* is used or its stable diazo compound, which is known to the trade as *Nitrazol C*.

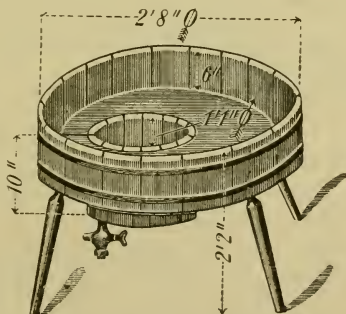
Preparing the Yarn.

The yarns are first boiled with caustic soda or soda ash, then washed, and dried thoroughly, as indicated on page 64.

The raw, unboiled yarn is frequently, however, mordanted direct, in which case it is important that the yarn be well and evenly impregnated with the mordanting liquor.

Mordanting with Beta Naphtol or Beta Naphtol RC.

This process is carried out either in a bowl of the shape as shown in the sketch below, or in a tramping machine of the kind frequently used for the mordanting of Alizarine Red; *Beta Naphtol RC* is employed for more bluish shades.



The mordanting bath is prepared as follows for 100 lbs cotton yarn:

- | | | |
|----|---|---|
| I. | { | 1000 grms. (2 lbs 3¼ oz) Beta Naphtol or Beta Naphtol RC are mixed with |
| | | 1000 grms. (2 lbs 3¼ oz) caustic soda lye of 75° Tw., then |
| | | 10 litres (2¼ gallons) boiling water are added, and the whole is stirred until dissolved. |

In another vessel,

- II. { 2500 grms. ($5\frac{1}{2}$ lbs) castor-oil soap are dissolved* in
 { 10 litres ($2\frac{1}{4}$ gallons) boiling water.

An equal quantity of Turkey-red oil may be used in the place of castor-oil soap; with the latter, however, somewhat bluer and brighter shades are obtained.

Mix I and II, and dilute to 60 litres ($13\frac{1}{4}$ gallons).

Fill the trough with 15 litres ($3\frac{1}{2}$ gallons) of this liquor, which should be lukewarm (about 40° C. or 105° F.), pass 2 lbs of the yarn through, add 900 ccm. ($1\frac{9}{16}$ pints) more of the liquor, pass another 2 lbs of yarn through, and so on until the whole lot of 100 lbs has been passed. Then pass the yarn in lots of 2 lbs at a time once more through the same liquor, wring off, wrap it up in calico, and hydro-extract well for 15 or 20 minutes.

The yarn is then hung up rather loosely over square sticks (not more than 1 lb for each stick), dried sharply, best overnight, and then developed without delay.

a) *Developing with Paranitraniline C for 100 lbs of yarn.*

- | | | | |
|-------------|---|--|--|
| Liquor
A | { | 850 grms. (1 lb 14 oz) Paranitraniline C are well mixed with | |
| | | 3 litres ($5\frac{1}{4}$ pints) boiling condensed water and dissolved with | |
| | | 2 litres ($3\frac{1}{2}$ pints) hydrochloric acid of 32° Tw. | |
| | | This acid solution is run in a thin stream while constantly stirring into | |
| | | 20 litres (about $4\frac{1}{2}$ gallons) water which should be the coldest procurable. | |
| | | After the solution has cooled off to at least 14° C. (57° F.), | |
| | | 500 grms. (1 lb $1\frac{9}{16}$ oz) nitrite of soda dissolved in | |
| | | 2 litres (about 4 pints) cold water are poured in in one lot while stirring, and the clear solution resulting after about 10 minutes is diluted to | |
| | | 42 litres ($9\frac{1}{4}$ gallons). | |

* Castor-oil soap is prepared as follows:

- 10 kilos (20 lbs) castor-oil (of the first pressing) are well mixed with
 $8\frac{1}{2}$ kilos (17 lbs) caustic soda lye of 36° Tw., and boiled for 1 hour;
 after about 5 hours, when the soap is cooled off to some extent,
 2.2 kilos (4 lbs 14 oz) hydrochloric acid of 32° Tw. are added; the whole is boiled again for $\frac{1}{2}$ hour, and after it has become cool, the solution of sodium chloride formed is drawn off.

In another vessel,

Liquor	{	570 cc	(1 pint) caustic soda lye of 75° Tw. or
B		1420 ccm (2½ pints) of 36° Tw. are	
		18 litres	(4 gallons).

Or, if a more bluish red is required,

Liquor	{	500 ccm	(7/8 pint) caustic soda lye of 75° Tw. or
		1250 ccm (2¾ pints) of 36° Tw. are	
		7½ litres	(1 gall. 5 pints) and mixed with a
BI			solution of
		1 kilo	(2 lbs 3½ oz) acetate of soda dissolved in
		7½ litres	(1 gall. 5 pints) cold water, and the
			whole is diluted to
		18 litres	(4 gallons.)

Or, for producing a still bluer shade of red,

Liquor	{	2 kilos (4 lbs 7 oz) acetate of soda are dissolved in
BII		18 litres (4 gallons) cold water.

b) *Developing with Nitrazol C pat. for 100 lbs of yarn.*

Liquor	{	5½ kilos (12 lbs 2 oz) Nitrazol C are dissolved
		whilst stirring in
A		30 litres (about 6½ gallons) cold water. After
		30 or 40 minutes' standing, the solution
		is passed through a hair sieve and
		diluted to
		42 litres (9¼ gallons).

In another vessel,

Liquor	{	1900 ccm	(3¾ pints) caustic soda lye of 75° Tw.
B		or 4750 ccm (1 gallon ¾ pint) of	
		36° Tw. are diluted with cold water to	
		18 litres	(4 gallons).

Or, if a more bluish shade is required,

Liquor	{	1700 ccm	(3 pints) caustic soda lye of 75° Tw.
		or 4250 ccm (7½ pints) of 36° Tw. are	
		7½ litres	(1 gallon 5 pints), mixed with a
BI			solution of
		1200 grms.	(2 lbs 10½ oz) acetate of soda in
		7½ litres	(1 gallon 5 pints) cold water, and the
			whole is diluted to
		18 litres	(4 gallons).

For developing, take 7 parts of Liquor A and 3 parts of Liquor B, BI, or BII, and work in a trough similar to that recommended for mordanting, but a little larger (about 16 inches in diameter and 10 inches deep and with a holding capacity of about $6\frac{1}{2}$ gallons).

Charge this trough with 12 litres (2 gallons 5 pints) of the coldest water procurable, 10 litres ($2\frac{1}{4}$ gallons) of Liquor A and $4\frac{1}{2}$ litres ($7\frac{1}{2}$ pints) of Liquor B, BI or BII.

Pass 2 lbs at a time of the mordanted and dried yarn through this mixture, wring off, pass through again (altogether about 1 minute), and wring off finally.

Then add 630 ccm ($1\frac{1}{3}$ pint) of Liquor A and 270 ccm ($\frac{1}{2}$ pint) of Liquor B, BI or BII, develop again 2 lbs of the yarn at a time, and continue working in this manner until the whole 100 lbs are developed.

Then put the yarn on ordinary yarn sticks, rinse thoroughly, and soap boiling hot.

The red turns considerably bluer by the hot soaping. The soaping may be repeated to advantage, in which case the yarn is given a hot rinsing bath in between.

The proportions for preparing the diazo solution of the Paranitraniline (Liquor A) have been so calculated that no ice is needed for diazotising if very cold well water is available. On hot days, however, it is advisable to add small pieces of ice to the trough, especially if the temperature of the dye-house is higher than 20° C. (68° F.).

If the neutralising is done with caustic soda lye alone, a somewhat more yellowish red is obtained; the diazo solution however keeps considerably better, and the cost is slightly reduced. The bluest shade of red is obtained when working with acetate of soda alone.

Special care should be taken that the hydrochloric acid and the caustic soda lye are of exactly the strength indicated. A good red can only be expected with certainty if the stated proportions are strictly adhered to.

DYEING OF MERCERISED COTTON YARN.

Merцерising: The mercerising is carried out by the well-known short treatment of cotton yarns, stretched on special mercerising machines, with cold caustic soda lye of 52° Tw.

The yarns, before mercerising, are well boiled for a few hours, rinsed, and then whizzed. Their lustre in the first place depends on the treatment with caustic soda lye, the degree of tension, and of course also on the kind of cotton used. Fine, long-stapled Egyptian cotton yields the finest lustre, although American cotton is also frequently used. After mercerising, the yarns are rinsed with warm water, soured off, rinsed cold, and dyed.

For the production of light and bright shades, the yarns after mercerising are bleached in the usual manner.

Dyeing: The good result of the dyeing operation, and especially so the levelness of the shade, is very dependent on the correct, thorough and even mercerising, which operation should therefore be carried out with special care. A drying of the yarns after the mercerising and before the dyeing is not necessary, and has if anything an unfavourable effect. Care should therefore be taken that there are no dry spots in yarns to be dyed.

Mercerised cotton yarns are generally dyed with the same dyestuffs as ordinary yarns (see tables on pages 100—119).

The method of dyeing is also the same (see general part, page 5 et seq.), except that it is carried out a little more slowly in view of the fact that mercerised yarns absorb dyestuffs more rapidly than ordinary yarn.

For *Diamine Colours* the quantity of salt is consequently reduced, light shades being in fact dyed to best advantage without any salt at all. In order to retard the exhaustion of the dyebath and to ensure a uniform absorption of the dyestuffs, some Monosolvol, Turkey-red oil or soap is frequently added.

Immedial Colours are likewise dyed with a reduced quantity of salt, light shades without any salt at all, and some Monosolvol, Turkey-red oil or soap may be added. It is an advantage also to slightly increase the quantity of sodium sulphide and to dye at a lower temperature (70—80° C. or 160—175° F.) than customary with the ordinary yarns.

When using *Hydron Colours*, it is an advantage, same as with Diamine and Immedial Colours, to add some Monosolvol or Turkey-red oil to the dyebath, and for light shades to increase the quantity of hydrosulphite and start dyeing at a low temperature, and then to heat gradually.

If *Basic Colours* are used for dyeing, about one-quarter less tannin and antimony salts is required for mordanting than is necessary for ordinary cotton yarns; on the other hand, the quantity of acetic acid to be added in the dyeing is to advantage increased. Light shades are also frequently dyed without any tannin mordant, the yarns being first bottomed with Diamine Colours, then rinsed, and topped with Basic Colours in a fresh cold bath acidulated with acetic acid.

Lustreing. In order to enhance the lustre, the mercerised yarn is struck out well after the dyeing, dried, and in addition thereto frequently also lustred by glossing at the wringing post or in special lustreing machines.

DYESTUFFS FOR MERCERISED YARNS WITHSTANDING BRIGHTENING IN AN ACID BATH.

Yarns which are to be given a silky scroop (see page 121) by brightening in an acid bath should be dyed with the following dyestuffs, for preference with those marked with an asterisk (*).

Yellow and Orange:

- *Diamine Fast Yellow B, FF, A, AGG
- Diamine Yellow CP
- *Diamine Orange G, B
- Diamine Orange D
- Diamine Fast Orange EG, ER
- *Primuline, treated with chloride of lime

Immedial Yellow D, GG

- | | |
|------------------------------|--------------------------------------|
| *Thioflavine T, TCN | } on a
tannin-antimony
mordant |
| *Para Phosphine R, G, GG | |
| *Diamond Phosphine GG, PG, R | |
| *Tannin Orange R, GG | |

Pink and Red:

- | | |
|--|--|
| Diamine Rose, all brands | |
| Direct Rose T | |
| Diamine Brilliant Scarlet S | |
| *Diamine Fast Scarlet GG, GFF, 4BFF, 4BFS, | |
| 5BFF, 7BFF | |
| Diamine Fast Scarlet SBF, 8BN, 10BF | |
| *Primuline | |
| *Diamine Azo Scarlet A, B, | } diazotised and
developed with
Beta Naphtol |
| 4B, 8B | |
| *Irisamine G | } on a
tannin-antimony
mordant |
| *Rosazeine 6G | |
| Safranine, all brands | |
| *Thioflavine T, TCN | |
| *Diamond Phosphine | |
| *Para Phosphine | |
| *Tannin Orange R | |

Claret, Prune and Violet:

- Diamine Bordeaux S
- Diamine Brilliant Bordeaux R
- Diamine Brilliant Violet B, RR
- Oxy Diamine Violet B, BF
- *Diamine Heliotrope
- Combinations of
- *Diamine Azo Blue 2R
- *Diaminogene Blue 3RN
- *Primuline
- Primuline, diazotised and developed with
Bordeaux Developer
- *Diamine Azo Bordeaux B, diazotised and developed
with Beta Naphtol
- Immedial Bordeaux G conc., GF conc.
- Immedial Maroon B conc.
- *Immedial Red Brown 3R
- *Immedial Prune S
- Immedial Violet C
- *Tannin Heliotrope
- *Methyl Violet, all brands
- *Crystal Violet 10B

} diazotised and
developed with
Beta Naphtol

} on a
tannin-antimony
mordant

Blue:

- *Diamine Blue 2B, 3B, BG
- Diamine Blue AZ, 3R, RW, NC
- *Diamine Sky Blue, all brands
- *Diamine Pure Blue A
- Diamine Brilliant Blue G
- Diamine New Blue R
- *Diamine Fast Blue FFB, G
- Diamine Fast Blue FFG
- Diamine Bengal Blue G
- *Oxy Diamine Blue B, G, 3G, 5G
- *Diamine Steel Blue L
- Diamineral Blue CV, CVB
- Diamine Dark Blue B
- *Diaminogene Blue, all brands
- *Diaminogene Sky Blue N
- *Diaminogene Dark Blue
- *Diamine Azo Blue R, RR, 6B
- *Diamine Heliotrope O, B, G
- *Diamine Black BH

} diazotised and
developed with
Beta Naphtol

*Diamine Azo Blue R	}	diazotised and developed with Naphthylamine Ether N
Diamine Azo Blue RR, 6B		
*Diamine Black BH		
*Immedial Indone, all brands		
Immedial Indogene GCL conc., BCL conc.,		
RCL conc., RRCL conc.		
Immedial Direct Blue B, JB, R,		
single and concentrated brands.		
Immedial Dark Blue J		
Immedial Blue, all brands, dyed direct or developed.		
*New Methylene Blue, all brands	}	dyed on a tannin-antimony mordant
*Methylene Blue BB		
*Naphtindone BB, BR		
*Indazine M		

Green and Olive:

Diamine Green G, CL, FG		
*Diamine Green B		
*Diamine Dark Green N		
shaded with		
*Diamine Fast Yellow B, FF, A, AGG		
*Diamine Orange G		
*Oxy Diamine Brown 3GN.		
Combinations of		
*Diamine Sky Blue, all brands		
*Diamine Pure Blue A		
*Diamine Fast Blue FFB, G		
with		
*Diamine Fast Yellow FF, B, AGG		
*Oxy Diamine Brown 3GN		
*Diamine Brown 3G		
*Diamine Orange G		
*Brilliant Green	{	all brands
*Solid Green		
*New Methylene Blue GG, shaded with	}	dyed on a tannin-antimony mordant
*Thioflavine T, TCN,		
*Para Phosphine, or		
*Diamond Phosphine		

Immedial Green, all brands
 Immedial Brilliant Green G extra
 Immedial Olive 3G
 Immedial Yellow Olive G, 5G
 shaded with
 *Immedial Dark Brown D conc.
 Immedial Yellow D, GG
 Immedial Yellow Brown EN
 *Immedial Cutch BG
 Immedial Cutch O, G, BGG.

Brown and Bronze:

*Diamine Brown B, 3G, No. 33, 36
 Diamine Brown M, MR
 *Diamine Catechine G
 Diamine Catechine B, 3G
 *Oxy Diamine Brown 3GN, KS, KMS, KRS, KBS
 Diamine Fast Brown G, R, GB
 Diamineral Brown G
 *Diamine Bronze G, ST
 Diamine Nitrazol Brown BD, B, G } coupled with
 *Diamine Brown S } Nitrazol C
 *Immedial Cutch BG
 Immedial Cutch O, G, BGG
 *Immedial Brown BR, RR, W conc.
 Immedial Yellow Brown EN
 *Immedial Dark Brown D conc.
 *Immedial Bronze A
 *Immedial Red Brown 3R
 *Immedial Prune S
 shaded with
 *Immedial Black NRT or NNG conc.

Grey and Mode Shades:

Combinations of
 *Diamine Fast Blue G, FFB
 *Diaminogene extra, B
 *Diamine Dark Blue B
 *Diamine Fast Yellow B, FF
 *Diamine Orange G
 *Oxy Diamine Brown 3GN
 Diamine Fast Orange EG, ER
 Diamine Catechine B
 *Diamine Heliotrope B

- *Diamine Grey G
- *Diamine Jet Black SS, Cr } for Grey
- *Indo Carbon S, SF aftertreated with bichrome
- *Immedial Black and *Immedial Carbon
shaded with
- Immedial Yellow Olive G, 5G
- Immedial Yellow Brown EN
- *Immedial Cutch BG
- Immedial Cutch O, G, BGG, R
- *Immedial Brown BR, RR
- *Immedial Dark Brown D conc.

Black:

- *Oxy Diamine Black US
- Oxy Diamine Black D, SA
- Para Diamine Black, all brands
- Diamine Jet Black SS, Cr
- Diamine Fast Black F, X
- Diamineral Black B, 3B, 6B, aftertreated with
bichrome and sulphate of copper
- *Diaminogene { all brands } diazotised and developed
with Beta Naphtol,
*Oxy Diaminogene { brands } Phenylene Diamine or
combinations of these
*Diamine Black BH, DN, DB } developers
- *Indo Carbon S, SF, aftertreated with bichrome
- Immedial Black*
- Immedial Brilliant Black*
- Immedial Carbon*
- Immedial Brilliant Carbon* } all brands, to advantage
aftertreated with bichrome
- especially
- Immedial Black FF extra
- Immedial Black NBB conc., BF conc., NNG conc.
- Immedial Brilliant Black B
- Immedial Brilliant Black 5BV conc., 6BG conc.,
- Immedial Carbon B [SBG conc.]
- Immedial Brilliant Carbon F, FB, FG.

* When brightening the blacks produced with Immedial Black and Immedial Carbon, the addition of acetate or formate of soda to the acid bath is indispensable (see page 36), and the acid to be used for this purpose must be free from sulphuric acid.

DYESTUFFS FAST TO MERCERISING.

Dyed yarns which are woven up and subsequently mercerised in the piece must necessarily be dyed with colours which withstand the mercerising process.

The Diamine Colours enumerated in the following list come only into consideration for light shades, whereas the Immedial and Hydron Colours mentioned may also be employed for the production of deep shades.

It must however always be borne in mind that almost all colours are apt to bleed, more or less, when acted upon by caustic soda lye for a prolonged time. Mercerised pieces containing coloured shot effects should not therefore be left lying after passing through the caustic bath, but should be at once stretched, rinsed, acidulated, and rinsed again finally.

The following colours resist such mercerising:

Yellow:

Diamine Fast Yellow B, FF, AGG	} in light shades
Primuline, aftertreated with chloride of lime	
Immedial Yellow D, GG	

Orange:

Diamine Orange G, D	} in light shades
Diamine Fast Orange EG, ER	
Immedial Orange C	

Pink and Red:

Diamine Rose, all brands	} in light shades
Direct Rose T	
Diamine Fast Scarlet GG, GFF, 4BFF,	
4BFS, 7BFF, 8BF, 8BN, 10BF	
Diamine Azo Scarlet. all brands	} in light and medium shades
Primuline, diazotised and developed	
with Beta Naphtol	
Paranitraniline Red	

Violet and Claret:

Oxy Diamine Violet B, R, G	} in light shades
Diamine Brilliant Bordeaux R	
Diamine Fast Violet FFBN, FFRN	

Immedial Bordeaux G conc., GF conc.
 Immedial Indone Violet B conc.
 Immedial Violet C, CB, CR in light and medium shades.

Blue:

Diamine Sky Blue	} in light shades
Diamine Blue RW	
Diamine Azo Blue R	
Diaminogene Sky Blue N, diazotised and developed with Beta Naphtol	

Immedial Indone, all brands
 Immedial Indogene, all brands
 Immedial Direct Blue, all brands
 Immedial Blue, all brands
 Immedial New Blue G conc.
 Immedial Green Blue CV

Hydron Blue, all brands.

Green and Olive:

Diamine Green B, BO, BZ, G, CL shaded with	} in light shades
Diamine Fast Yellow B, FF, AGG	
Diamine Fast Orange EG, ER	
Diamine Orange G, D	
Diamine Green G, aftertreated with chrome salts	

Immedial Green, all brands
 Immedial Brilliant Green G extra
 Immedial Deep Green G
 Immedial Dark Green B
 Immedial Olive B, GG, 3G
 Immedial Yellow Olive G, 5G
 shaded with

Immedial Yellow D, GG
 Immedial Cutch O, G
 Immedial Yellow Brown EN
 Immedial Indogene GCL conc.

Brown:

Diamine Nitrazol Brown G, GF, RD, T,
coupled with Nitrazol C, in light shades
Immedial Cutch, all brands
Immedial Yellow Brown EN
Immedial Brown, all brands
Immedial Dark Brown A, D conc.
shaded with
Immedial Black NRT or NNG conc.

Mode Shades:

Combinations of

Immedial	Yellow Olive G, 5G
Immedial	Cutch, all brands
Immedial	Brown RR, W conc.
Immedial	Yellow Brown EN
Immedial	Dark Brown D conc.
Immedial	Olive B
Immedial	Black NRT, NNG conc.
Immedial	Carbon B.

Grey and Black:

Immedial Black	} all brands
Immedial Brilliant Black	
Immedial Carbon	
Immedial Brilliant Carbon	
Indo Carbon	

for Grey shaded with
 Immedial Yellow Olive G, 5G
 Immedial Dark Brown D conc.
 Immedial Cutch G, O
 Immedial Brown RR, W conc.
 Immedial Direct Blue B.

DYESTUFFS FAST TO ACIDS AND MILLING, FOR SHOT EFFECTS.

For dyeing loose cotton, artificial silk, yarns, etc. used for shot effects which after weaving into woollen goods must resist the milling and acid cross-dyeing, the Diamine, Immedial, Hydron and Basic Colours come into consideration.

The shades produced with Diamine and Basic Colours as a rule are rendered a little paler by the acid cross-dyeing, those dyed with Immedial Colours on the other hand becoming slightly duller, especially so when the wool is dyed a very deep shade; the latter should therefore be dyed a brighter shade from the start.

The Immedial and Hydron Colours come principally into consideration if the wool is required to remain unstained and exacting demands are made as regards fastness to light and milling of colours contiguous to white; the Diamine and Basic Colours on the other hand are preferred for very bright and clear shot effects.

The following dyestuffs are best suited for this purpose:

Yellow:

Primuline, aftertreated with chloride of lime

Primuline, diazotised and developed with Phenol.

Thioflavine T, TCN, dyed on a tannin-antimony mordant
and subsequently fixed therewith

Immedial Yellow GG, D.

Orange:

Primuline, diazotised and developed with Resorcline

Thioflavine T, TCN shaded with

Irisamine G, G extra

Rosazeïne 6G

} dyed on a tannin-
antimony mordant
and subsequently
fixed therewith

Immedial Orange C.

Red:

Primuline

Diamine Azo Scarlet, all brands

} diazotised and
developed with
Beta Naphtol

Paranitraniline Red.

Claret:

Primuline, shaded with	}	diazotised and developed with Beta Naphtol or Bordeaux Developer
Diamine Black BH or		
Diaminogene Blue 3RN		
Diamine Azo Bordeaux B, diazotised and		developed with Beta Naphtol
Immedial Red Brown 3R, shaded with		
Immedial Cutch O		
Immedial Orange C		
Immedial Dark Brown D conc.		

Violet:

Tannin Heliotrope	}	dyed on a tannin- antimony mordant and subsequently fixed therewith
shaded with		
Crystal Violet 10B		
Rosazeïne 6G		
Immedial Indone Violet B conc.		
Immedial Violet C		
Immedial Prune S		
topped with		
Tannin Heliotrope	}	and subsequently fixed with tannin and antimony.
Crystal Violet 10B		
Rosazeïne 6G		

Blue:

Victoria Blue B	}	dyed on a tannin- antimony mordant and subsequently fixed therewith
New Methylene Blue N, GG, R		
Crystal Violet 10B		
saddened with		
Naphtindone BB		
Indazine M		
Diaminogene Sky Blue N	}	diazotised and developed with Beta Naphtol
Diaminogene Blue NA, NB, 2RN		
3RN, 6RN		
Oxy Diamine Violet BF		
Diamine Heliotrope O		
Diamine Black BH, BO, RO		
Immedial Direct Blue B, JB, R		
Immedial Blue CR, dyed direct and developed		
Immedial Indone, all brands		
Immedial Indogene GCL conc., BCL conc.,		
RCL conc., RRCL conc.		
Hydron Blue G, R powder and paste.		

Green and Olive:

Brilliant Green Crystals extra	}	dyed on a tannin-antimony mordant and subsequently fixed therewith
Solid Green Crystals O		
shaded with		
Thioflavine T, TCN		
New Methylene Blue GG		
Para Phosphine or	}	diazotised and developed with Phenol
Diamond Phosphine		
Primuline, shaded with		
Diamine Black BH		
Oxy Diaminogene FFN, ED		
and if necessary with	}	aftertreated with chrome salts
Oxy Diamine Brown 3GN		
Diamineral Blue R	}	
shaded with		
Diamine Yellow N	}	
Immedial Green GG extra, BB extra		
Immedial Brilliant Green G extra		
Immedial Dark Green B		
Immedial Olive B		
Immedial Yellow Olive G, 5G.		

Brown:

Combinations of	}	diazotised and developed with Resorcine
Primuline with		
Diamine Black BH or		
Oxy Diaminogene ED	}	diazotised and boiled with soda
Diamine Cutch		
shaded with		
Primuline	}	coupled with Nitrazol C
Diamine Nitrazol Brown RD. G, T		
Diamine Brown S, MR		
Immedial Cutch, all brands		
Immedial Yellow Brown EN		
Immedial Brown, all brands		
Immedial Dark Brown A		
Immedial Dark Brown D conc.		

Grey and Mode Shades:

Combinations of	
Diamine Black BH, BO, RO	} diazotised and developed with Phenylene Diamine, Resorcline, Beta Naphtol, or combinations of these developers, or with Phenol
Oxy Diaminogene ED, FFN	
Primuline	
Diamine Brown M	
Oxy Diamine Brown 3GN	
Indo Carbon	} all brands, for grey shades, to advantage aftertreated with bichrome
Immedial Black	
Immedial Brilliant Black	
Immedial Carbon	
Immedial Brilliant Carbon	
In combination with	
Immedial Cutch, all brands	
Immedial Brown BR, RR, W conc.	
Immedial Dark Brown D conc.	
Immedial Yellow Brown EN	
Immedial Yellow Olive G, 5G	
Immedial Olive B	
Immedial Prune S.	

Black:

Oxy Diaminogene, all brands	}	diazotised and developed
Diaminogene, all brands		with Phenylene Diamine,
Diamine Black BH, BO, RO		Resorcline, Beta Naphtol, or combinations of these developers
Indo Carbon S, SF, aftertreated with bichrome		
Immedial Black	}	all brands, first
Immedial Brilliant Black		aftertreated with bichrome,
Immedial Carbon		and once more with
Immedial Brilliant Carbon		acetate of soda or soda (see page 36).

If the Immedial Colours are brightened by topping with Basic Colours, the cotton bottomed with Immedial Colours should be mordanted in the usual manner with tannin and antimony, and after topping the mordanting should be repeated in the old mordanting liquors.

In order to produce the coloured effects of the desired brilliancy, such colours must be selected for cross-dyeing as will not stain the cotton; see part II of this Manual (Wool Dyeing).

DYESTUFFS FAST TO STOVING.

The following dyestuffs resist the stoving with sulphur dioxide for 12 to 18 hours; after the subsequent washing, their shade is not altered at all or only very slightly so.

Yellow and Orange:

Thioflavine S
 Oxy Diamine Yellow GG, TZ
 Diamine Yellow N, CP
 Diamine Fast Yellow, all brands
 Diamine Gold
 Diamine Orange G, D, B
 Diamine Fast Orange EG, ER
 Oxy Diamine Orange G, R
 Primuline, treated with chloride of lime
 Primuline, diazotised and developed with Phenol or Resorcine
 Immedial Yellow GG, D
 Immedial Orange C

 Thioflavine T, TCN
 Diamond Phosphine GG, R
 Tannin Orange R, GG

} dyed on a
 tannin-antimony
 mordant

Pink and Red:

Diamine Rose, all brands
 Direct Rose T
 Diamine Purpurine, all brands
 Diamine Scarlet 3B
 Diamine Brilliant Scarlet S
 Diamine Fast Scarlet, all brands
 Diamine Fast Red F
 Diamine Brilliant Rubine S
 Diamine Violet Red

 Primuline
 Diamine Azo Scarlet, all brands

} diazotised and
 developed with
 Beta Naphtol

Diamine Nitrazol Scarlet A, coupled with Nitrazol C.

Safranine, all brands	}	dyed on a tannin-antimony mordant
Irisamine G		
Rosazeïne B, 6G		
shaded with		
Diamond Phosphine GG, R		
Thioflavine T, TCN		

Claret and Violet:

Diamine Bordeaux S, VRO, B	}	diazotised and developed with Beta Naphtol
Diamine Brilliant Bordeaux R		
Diamine Brilliant Violet B, RR		
Diamine Fast Violet FFBN, FFRN		
Diamine Violet N, BB		
Oxy Diamine Violet B, R, G	}	dyed on a tannin-antimony mordant
Diamine Heliotrope G, O, B		
Primuline, shaded with		
Diamine Black BH or		
Diaminogene Blue 3RN		
Diamine Azo Bordeaux B	}	all brands
Primuline, diazotised and developed with Bordeaux Developer		
Diamine Nitrazol Bordeaux GB, coupled with Nitrazol C		
Tannin Heliotrope		
Safranine		
shaded with	}	all brands
Diamond Phosphine GG, R		
Immedial Bordeaux G conc., GF conc.		
Immedial Prune S		
Immedial Violet C, CB, CR		
Immedial Indone Violet B conc.		

Blue:

Diamine Sky Blue	}	all brands
Diamine Blue		
Diamine Azo Blue		
Diamineral Blue		
Diamine Deep Blue		
Oxy Diamine Blue		
Diamine Fast Blue		
Diamine Bengal Blue		
Diamine Black		
Diamine Pure Blue A		
Diamine Brilliant Blue G		
Diamine Fast Brilliant Blue R		
Diamine Steel Blue L		

Diamine Dark Blue B	
Diamine Sky Blue FF, FFN, FFS	} aftertreated with copper sulphate
Diamine Blue RW	
Diamine New Blue R	
Diamineral Blue, all brands	} aftertreated with bichrome and copper sulphate
Diaminogene Blue, all brands	
Diaminogene Sky Blue N	} diazotised and developed with Beta Naphtol
Diaminogene Dark Blue	
Diamine Azo Blue, all brands	
Diamine Heliotrope G, B, O	
Oxy Diamine Violet BF	
Diamine Black, all brands	
Immedial Indone, all brands	
Immedial Indogene GCL conc., BCL conc., RCL conc., RRCL conc.	
Immedial Direct Blue, all brands	
Immedial New Blue G conc.	} dyed direct or developed
Immedial Blue, all brands	
New Methylene Blue GG, N	} dyed on a tannin-antimony mordant
Methylene Blue BB	
Indazine M	
New Blue	
Naphtindone } all brands	

Green and Olive:

Diamine Green, all brands
 Diamine Dark Green N
 shaded with
 Diamine Fast Yellow, all brands
 Diamine Yellow CP
 Oxy Diamine Orange G, R
 further, combinations of
 Diamine Pure Blue A
 Diamine Sky Blue, FF, FFN, FFS
 Diamine Blue 3B
 Diamine Fast Blue FFB, G
 Diamine Fast Yellow, all brands
 Diamine Yellow CP
 Thioflavine S

Immedial Green, all brands
 Immedial Brilliant Green G extra
 Immedial Deep Green G
 Immedial Dark Green B
 Immedial Olive B, GG, 3G
 Immedial Yellow Olive G, 5G

Brilliant Green Crystals extra	} dyed on a tannin- antimony mordant
New Methylene Blue GG, shaded with	
Thioflavine T, TCN, or	
Diamond Phosphine GG, R	

Brown:

Diamine Brown B, 3G, M, MR, R, S, No. 30a—44
 Diamine Catechine B, 3G
 Diamine Fast Brown R, G, GB
 Oxy Diamine Brown 3GN
 Diamine Brown 3G
 Diamine Catechine G
 Oxy Diamine Brown 3GN
 Diamine Brown MR, R, S
 Oxy Diamine Orange G, R
 Diamine Cutch, diazotised and boiled with soda

Immedial Cutch, all brands
 Immedial Yellow Brown EN
 Immedial Brown, all brands
 Immedial Dark Brown A
 Immedial Dark Brown D conc.
 Immedial Maroon B conc.

saddened with

Immedial Black	} all brands
Immedial Carbon	

Grey:

Diamine Grey G
 Diamine Fast Grey BN
 Diamine Jet Black SS, Cr, RB

further, combinations of

Diamine Dark Blue B
 Diamine Fast Blue FFB, G
 Diamine Fast Yellow B, FF, AGG, A
 Diamine Catechine B
 Oxy Diamine Brown 3GN
 Diamine Rose BD, GD

or, combinations of

Diamineral Blue BF, R	}	aftertreated with bichrome and sulphate of copper
Diamine Catechine B		
Diamine Brown 3G, M		
Diamine Fast Yellow B, A		

Indo Carbon S, SF, aftertreated with bichrome

Immedial Black	}	all brands
Immedial Brilliant Black		
Immedial Carbon		
Immedial Brilliant Carbon		

Mode Shades:

Combinations of

Diamine Dark Blue B
 Diamine Fast Blue FFB, G
 Diamine Fast Yellow B, FF, A
 Diamine Catechine B
 Diamine Brown M
 Oxy Diamine Brown 3GN
 Diamine Rose BD, GD

or, combinations of

Diamineral Blue BF, R	}	aftertreated with copper sulphate or with bichrome and copper sulphate
Diamine Catechine B		
Diamine Brown 3G		
Diamine Fast Yellow B, FF, A		

or, combinations of

Immedial Cutch, all brands
 Immedial Brown, all brands
 Immedial Dark Brown D conc.
 Immedial Yellow Brown EN
 Immedial Yellow Olive G, 5G
 Immedial Black NRT, NNG conc.

Black:

Oxy Diamine Black N, NF, NR, SOOO, A, AM, AT, FFC, D, SA, UI, US	}	the single and "extra conc." brands.
Para Diamine Black, all brands		
Diamine Fast Black F, aftertreated with bichrome		
Diamine Jet Black SS, Cr, RB, dyed direct or aftertreated with bichrome		
Diamine Nitrazol Black B, BB	}	coupled with Nitrazol C
Oxy Diamine Black JWF, A, AM, D, JWF extra conc., JWF superior		
Oxy Diamine Black UI, US, JB, JWF, JEI extra conc., JB extra conc., JWB extra conc., JWF extra conc., JWN extra conc., JWF superior	}	aftertreated with formaldehyde and bichrome
Oxy Diamine Carbon JB, JEI		
Diamine Fast Black X, XN extra conc.		
Diamine Black BH, BO, RO	}	diazotised and developed with Beta Naphtol or Phenylene Diamine, or combinations of these developers
Diamine Azo Black B		
Diaminogene	{ all brands	
Oxy Diaminogene,		
Diamine Beta Black B, BB, diazotised and developed with Beta Naphtol		
Indo Carbon S and SF aftertreated with bichrome		
Immedial Black,	{ all brands	after stoving rinsed with the addition of acetate of soda (page 36).
Immedial Brilliant Black,		
Immedial Carbon		
Immedial Brilliant Carbon,		

DYESTUFFS WITHSTANDING BLEACHING WITH SODIUM PEROXIDE AND HYDROGEN PEROXIDE.

The following dyestuffs are best suited for dyeing cotton shots which when woven together with wool are required to withstand the bleaching of the latter with sodium peroxide and hydrogen peroxide:

Diamine Fast Yellow A	
Diamine Orange G, D	
Direct Rose T	
Diamine Fast Blue FFB, FFG	
Diamine Fast Brilliant Blue R	
Diamine Green FG, CL	
Diamineral Blue CVB	
Diamine Fast Scarlet, all brands	
Diamine Brilliant Violet B, RR	
Diamine Grey G	
Oxy Diamine Orange R	
Diamine Nitrazol Bordeaux GB	coupled with Nitrazol C
Oxy Diamine Brown G, RN	
Diamine Nitrazol Brown BD, G, T	
Diamine Brown S	
Diamine Bronze G	
Diamine Grey G	
Diamine Blue NC	
Primuline	
Diamine Azo Bordeaux B	diazotised and developed with Beta Naphtol
Diaminogene Blue NB, NA, 3RN, 6RN	
Diaminogene Sky Blue N	
Diamine Azo Blue R	
Diaminogene B, extra	diazotised and developed with Beta Naphtol or Phenylene Diamine
Diamine Black BO, RO, BH	
Oxy Diaminogene OB, OT, ED, FFN	
Diamine Cutch, diazotised and boiled with soda	
Primuline, treated with chloride of lime	
Immedial Indogene, all brands	
Hydron Blue, all brands	
Paranitraniline Red.	

DYESTUFFS WITHSTANDING VULCANISING.

The process of vulcanising or rubbering is carried out in a great variety of ways. It is therefore impossible to lay down hard and fast rules as to the proper selection of dyestuffs for each special case, and it is for this reason recommended to test the products for their property of withstanding the method of vulcanising resorted to in each particular case. As a guide it may be mentioned however that for fancy-coloured goods which are subjected to the process of hot vulcanising mostly employed, the Diamine, Immedial, Hydron and Basic Colours are used, of which the Immedial and the Hydron Colours again are those which generally resist this process best.

It is better not to aftertreat with sulphate of copper if the goods are to be subjected to the vulcanising process.

Any of the Immedial Colours may be used for the production of light shades, for deep shades the following in particular:

Immedial Cutch O, BGG	Immedial Violet C
Immedial Yellow D, GG	Immedial Indone Violet
Immedial Yellow Olive G, 5G	B conc.
Immedial Brown W conc., RR	Immedial Green BB extra
Immedial Prune S	

Immedial Indogene, all brands

Immedial Indone, all brands

Immedial Direct Blue, all brands

Immedial Black, all brands.

Hydron Blue G and R, powder and paste are adapted in every case.

Of the Diamine Colours, the following are the most suitable:

Thioflavine S	Diamine Fast Brown G, GB
Oxy Diamine Yellow CR	Oxy Diamine Brown 3GN
Diamine Fast Yellow AGG,	Cotton Dark Brown BM, BB
A, AR, B, FF	Diamine Bronze G
Diamine Yellow CP	Diamine Red, all brands
Diamine Gold	Diamine Purpurine,
Diamine Orange G, B	all brands
Diamine Fast Orange ER,	Diamine Fast Scarlet,
EG	all brands
Diamine Brown B, 3G, MR,	Diamine Fast Red F
M, No 30a, 33, 42	Diamine Brilliant Scarlet S
Diamine Catechine 3G	Diamine Rose, all brands.

Direct Rose T	Diamine Blue BX
Diamine Brilliant Rubine S	Diamineral Blue, all brands
Diamine Bordeaux S	Diamine Fast Blue FFG, G
Diamine Brilliant Bordeaux	Diamine New Blue R
R	Diamine Deep Blue R, B
Oxy Diamine Violet G, R	Diamine Fast Grey RN
Diamine Brilliant Violet B,	Diamine Black BH
RR	Para Diamine Black,
Diamine Dark Green N	all brands
Diamine Green B, CL, G, GF	Oxy Diamine Black SA,
Diamine Sky Blue FF	US, UI

Primuline, diazotised and developed with Beta Naphtol or Resorcine
 Primuline, treated with chloride of lime

Diaminogene Blue, all brands	} diazotised and developed with Beta Naphtol
Diaminogene Sky Blue N	
Diamine Azo Blue, all brands	
Diamine Heliotrope O, G, B	
Oxy Diamine Violet BF	
Diamine Azo Scarlet 4B, 8B	
Diamine Azo Bordeaux B	
Diamine Black, all brands	} diazotised and developed with Beta Naphtol, Phenylene Diamine, Resorcine or com- binations of these developers.
Oxy Diaminogene, all brands	
Diaminogene, all brands	

Of the Basic Colours, the following come into consideration:

Thioflavine T, TCN	Methylene Blue BB
Para Phosphine, all brands	Safranine, all brands
Bismarck Brown, all brands	Tannin Heliotrope
Solid Green crystals O	Rosazeine B, 6G
Brilliant Green cryst. extra	Irisamine G, G extra
New Methylene Blue N	Magenta Ia. Dia.

DYESTUFFS FOR GREY ON LOOSE

**Simplest method of production,
with normal fastness**

All the different brands of Oxy Diamine Black, Para Diamine Black and Diamine Black in light shades, viz:

For bluish greys:

Para Diamine Black, all brands
Oxy Diamine Black A, SA, FFC,
JW, JWF
Oxy Diamine Black JWF superior
Diamine Black BH, BHN.

For greenish greys:

Oxy Diamine Black JE, JEI, JB,
D, AT, UI.
Oxy Diamine Carbon JEI, JB.

For reddish greys:

Oxy Diamine Black RR, AM
Diamine Black RO.

The following dyestuffs are suitable
for shading:

Diamine Fast Yellow B, A
Oxy Diamine Violet B, R, G
Diamine Brown M, R, No. 30a,
33, 39
Oxy Diamine Brown RN, G, 3GN
Diamine Bronze Brown PE.

Of somewhat better fastness to light:

Oxy Diamine Black SOOO, B,
BM, NR.

The concentrated brands of Oxy Diamine Black and Para Diamine Black possess the same properties as the above-named products but considerably greater tinctorial power.

Of better fastness to light

Diamine Grey G
Diamine Dark Blue B
Diaminogene extra
Oxy Diaminogene OB, OT,
FFN, ED
Diamine Black DN, DB
Diamine Fast Black C high
conc., CB high conc., XN
extra conc.
Diamine Jet Black OO, Cr,
RB, SS
shaded with
Diamine Catechine B, 3G
Diamine Fast Yellow B, 3G
Diamine Orange G, D.

Of very good fastness to light:
for very light shades

Combinations of
Diamine Fast Blue FFB
Diamine Fast Brilliant Blue R
Diamine Fast Yellow B, FF
Diamine Fast Orange EG, ER
Diamine Fast Brown G, R
for deeper shades
Diamine Fast Black F, X
Diamine Fast Grey BN, RN
Diaminogene extra
shaded with the above-mentioned
shading products.

The same dyestuffs are used

COTTON AND COTTON YARN.

Fast to washing and milling

Exceedingly fast to light, washing and milling, resisting acid cross-dyeing*

- Diamine Jet Black
SS, Cr, RB, OO
Diamine Dark Blue B
Diamine Fast Grey BN
Diamine Fast Black X

} after-treated with bichrome
- Diamine Fast Black F
Diamineral Black
B, 3B, 6B

} after-treated with bichrome and copper sulphate
- Diamine Fast Black
C high conc.,
CB high conc., X

} after-treated with formaldehyde and bichrome

All these dyeings are likewise very fast to light.

The following dyestuffs are useful for shading:

- Diamineral Blue BF, R, CV, CVB
Diamine Fast Yellow B, FF,
Diamine Orange B [Δ, AR
Diamineral Brown G
Diamine Catechine B, 3G.

The following also resist acid cross-dyeing:

- Diamine Black BH
Oxy Diaminogene
ED, FFN
shaded with
Primuline
Diamine Brown M

} diazotised and developed with Phenylene Diamine, Resorcline, or Beta Naphтол

Any of the Immedial Blacks or Immedial Carbons and Indo Carbons may be used for grey shades.

The following are especially well adapted:

For bluish greys:

- Immedial Black V extra,
FF extra, NB, NBB conc.
Immedial Brilliant Black 5BV [conc.
Immedial Brilliant Carbon F
Indo Carbon S, SF.

For greenish greys:

- Immedial Black G extra,
NNG conc.
Immedial Brilliant Black
6BG conc., 8BG conc.
Immedial Carbon B
Immedial Brilliant Carbon FB, FG.

For reddish shades of grey:

- Immedial Black NF, NR, NRT,
NN conc., NLN conc., NNR conc.
Immedial Carbon JHJ, R, BL, KBL.

The following are useful for shading:

- Immedial Yellow Olive G, 5G
Immedial Dark Brown D conc.
Immedial Direct Blue B
Immedial Green BB extra.

For dyeing directions see pages 25 and 26; it has to be considered that light shades are dyed with a much larger proportion of sodium sulphide than deep shades, and with little or no salt.

An aftertreatment with sulphate of copper and bichromate of potash is very useful in the case of light greys, because dyeings which are not after-treated are apt to turn slightly more bluish on storing.

* For particulars of dyeing shot effects fast to acids see page 87.

DYESTUFFS FOR MODE SHADES ON

Simplest method of production, with normal fastness	Of better fastness to light
<p>Combinations of</p> <p>Diamine Catechine B, G, 3G Oxy Diamine Brown G, 3GN, RN Diamine Brown M, No. 30a, 33, 39, 41, 43, 44 Diamine Bronze Brown PE Diamine Black BH Oxy Diamine Black JW, JEI Diamine Fast Yellow B, FF, A Oxy Diamine Violet B, R Diamine Purpurine B, 3B Diamine Fast Scarlet GFF, 4BFF.</p>	<p>Combinations of</p> <p>Diamine Catechine B, 3G Diamine Orange D, G Diamine Dark Blue B Diaminogene extra Diamine Fast Yellow B, FF, A Diamine Rose BD, GD.</p> <p><u>Of very good fastness to light:</u> for very light shades</p> <p>Combinations of</p> <p>Diamine Fast Orange EG, ER Diamine Fast Brown G, R Diamine Fast Blue FFB Diamine Fast Brilliant Blue R Diamine Fast Yellow FF, B Diamine Fast Violet FFBN, Diamine Rose GD, BD [FFRN</p> <p>for deep shades</p> <p>Combinations of</p> <p>Diamine Fast Grey BN with the dyestuffs enumerated above.</p>

LOOSE COTTON AND COTTON YARN.

Fast to washing and milling

Exceedingly fast to washing and milling, of good fastness to light and resisting acid cross-dyeing*

Combinations of

Diamineral Brown G
Diamine Catechine
B, G, 3G
Diamineral Blue
BF, B, 3B, R
Diamine Brown M, 3G
Diamine Fast Yellow
A, FF
Diamine Fast Black F
Diamine Fast Grey BN
Diamineral Black
B, 3B, 6B

after-
treated
with
bichrome
and sul-
phate of
copper.

The dyeings aftertreated with bichrome and sulphate of copper are likewise very fast to light.

Fast to washing and milling, and
resisting acid cross-dyeing:

Primuline
in combination with
Diamine Black BH
or
Oxy Diaminogene
FFN, ED

} diazotised
and
developed
with
Resorcine,
or
Resorcine
and Beta
Naphtol.

Combinations of

Immedial Yellow Olive G, 5G
Immedial Yellow Brown EN
Immedial Bronze A
Immedial Cutch O, G
Immedial Brown W conc., RR
Immedial Dark Brown D conc.
Immedial Prune S
Immedial Black NRT,
NNG conc.
Immedial Carbon B.

For dyeing directions see pages 32 and 33; it has to be observed that light shades require much more sodium sulphide comparatively than deep shades, and should be dyed with little or no salt.

By an aftertreatment with copper sulphate and bichrome, the fastness to light of the dyed shades may be enhanced.

* For particulars of dyeing shot effects fast to acids see page 87.

DYESTUFFS FOR BROWN ON LOOSE

Simplest method of production, with normal fastness	Of better fastness to light
<p><u>For bright shades of Brown:</u></p> <p>Oxy Diamine Brown G, 3GN Diamineral Brown G Diamine Catechine 3G Diamine Brown 3G, 5G, R, ATC, No. 31, 33, 39, 40 Diamine Nitrazol Brown RD.</p> <p><u>For covered shades of Brown:</u></p> <p>Oxy Diamine Brown RN Diamine Brown 2G, M, MR, B, S, No. 30, 32, 34—38, 41—45 Diamine Catechine B, G Cotton Dark Brown BM, BB Diamine Nitrazol Brown BD, T Diamine Bronze Brown PE Diamine Bronze G, ST.</p> <p>The following dyestuffs are especially <u>well suited for shading</u> <u>towards red and violet:</u></p> <p>Diamine Red 4B Diamine Bordeaux VRO Oxy Diamine Violet B, G, R;</p> <p><u>towards yellow and orange:</u></p> <p>Diamine Yellow CP Diamine Fast Yellow B, A, AR Oxy Diamine Orange G, R.</p> <p>For saddening, any of the Oxy Diamine Blacks or Para Diamine Blacks may be used.</p>	<p>Diamine Fast Brown G, R, GB Diamine Fast Orange EG, ER shaded with Diamine Fast Blue FFB Diamine Fast Grey BN Diamine Fast Black F, X Diamine Fast Yellow B, FF, A</p> <p>Diamineral Brown G Diamine Brown M, B, R, 3G Diamine Catechine B, 3G, G shaded with Diamine Fast Yellow B, FF, A Diamine Yellow CP or saddened with Diamine Dark Blue B Diamineral Blue R, B, BF Diamineral Black B, 3B, 6B Diamine Fast Black F, X</p> <p style="text-align: right;">after- treated with copper sulphate.</p>

COTTON AND COTTON YARN.

Fast to washing and milling

Exceedingly fast to washing and milling, of good fastness to light, and resisting acid cross-dyeing*

Diamine Nitrazol Brown
*RD, BD, B, G, *T, GF
Oxy Diamine Brown
RN, G

Oxy Diamine Orange
G, R

Diamine Brown *S, *MR
shaded with

Diamine Nitrazol Black*
Oxy Diamine Black A, JE
Diamine Fast Yellow A

Diamine Brown M, R, B
Diamine Catechine G, 3G
Diamineral Brown G
Oxy Diamine Brown RN
shaded with

Diamine Fast Yellow
A, FF, B

Diamineral Blue R, BF
Diamineral Black B, 3B

coupled
with
Nitrazol
C

after-
treated
with
bichrome
and
copper
sulphate

For bright shades of Brown:

Immedial Cutch O, R,
BGG, BG.

For yellowish Browns:

Immedial Yellow Brown EN
Immedial Cutch G.

For more reddish Browns:

Immedial Red Brown 3R
Immedial Maroon B conc.
Immedial Prune S.

For covered shades of Brown:

Immedial Brown B, BR, BRS,
RR, W conc.
Immedial Dark Brown A, DS,
D conc.

The following are useful for shading:

Immedial Yellow Olive G, 5G
Immedial Olive B, 3G
Immedial Bordeaux G conc.,
GF conc.

and the following for saddening:

Immedial Black }
Immedial Carbon } all brands.

Dye according to directions on
pages 33 and 34.

The fastness to light may be
enhanced by an aftertreatment with
sulphate of copper and bichrome.

The dyeings aftertreated with
bichrome and copper sulphate
possess *very good fastness to light*.

Diamine Brown S, M, ATC
Diamine Fast Orange

EG, ER

Diamine Fast Brown R, G
Diamine Nitrazol Brown
G, RD

after-
treated
with
formal-
dehyde
and
bichrome

*Diamine Cutch, diazotised and
boiled with soda

*Primuline, shaded with

*Diamine Black BH

diazotised
and
developed
with
Resorcline

The dyestuffs marked with an
asterisk (*) withstand also acid cross-
dyeing.

* For particulars of dyeing
shot effects fast to acids see page 87.

DYESTUFFS FOR YELLOW AND ORANGE

Simplest method of production, with normal fastness	Of better fastness to light
<u>For greenish shades of Yellow:</u>	<u>For greenish shades of Yellow:</u>
Thioflavine S Oxy Diamine Yellow TZ, GG, CR, NY 200.	Diamine Fast Yellow 3G.
<u>For full shades of Yellow:</u>	<u>For full shades of Yellow:</u>
Diamine Fast Yellow FF, M, AGG, A, AR, B Diamine Yellow CP, CPO, CPI, CPII, N.	Diamine Fast Yellow FF, M, AGG, B, A, AR Diamine Yellow CP, CPO, CPI, CPII, N Primuline, treated with chloride of lime.
<u>For Orange:</u>	<u>For Orange:</u>
Oxy Diamine Orange G, R, RN Diamine Orange G, D, F, B.	Diamine Fast Orange EG, ER Diamine Orange B, aftertreated with sulphate of copper.
	For producing cream shades, the following are used principally:
	Diamine Fast Yellow FF, A, B *Diamine Yellow CP *Diamine Fast Orange EG, ER Diamine Orange G, D *Diamine Yellow N.
	The products for cream shades marked with an asterisk (*) are easily stripped with Hyraldite.
	Tropaeoline O, OO, G which likewise possess good fastness to light and which come off already in a warm soap bath, may also be used for producing cream shades.
	Diamine Fast Yellow 3G and Diamine Yellow N should be dyed with the addition of a little soap and phos- phate of soda in water free from lime.

ON LOOSE COTTON AND COTTON YARN.

Of better fastness to washing
and milling

Exceedingly fast to washing and
milling, resisting acid cross-dyeing*

For greenish shades of Yellow:

*Thioflavine T, TCN } on a tannin-
*Paraphosphine GG } antimony
mordant

For reddish shades of Yellow and Orange:

*Paraphosphine G, R, }
P, AGE, L }
Diamond Phosphine }
GG, D, PG, R } on a tannin-
Tannin Orange R, GG } antimony
*Thioflavine T } mordant
shaded with }
*Irisamine G }

Diamine Nitrazol Orange R,
coupled with Nitrazol C

*Primuline, diazotised and developed
with Resorcine.

Of better fastness to washing, milling
and light:

*Primuline,
treated with chloride of lime

*Primuline, diazotised and developed
with Phenol

Diamine Fast Yellow 3G,
aftertreated with sulphate of copper
and bichromate of potash

*Diamine Yellow N,
aftertreated with chrome salts.

The dyestuffs marked with an
asterisk (*) are also fast to acid cross-
dyeing, especially Primuline diazotised
and developed, or treated with chloride
of lime.

Immedial Yellow GG, D
Immedial Orange C.

Dyed according to the directions
on page 32.

Immedial Yellow D and Immed-
ial Orange C may be aftertreated
with bichrome and copper sulphate
by which the resistance to boiling
and especially also the fastness to
light is enhanced.

* For particulars of dyeing shot
effects fast to acids see page 87.

DYESTUFFS FOR PINK AND RED

For very bright Pinks and Reds,
of inferior fastness to washing

Simplest method of production,
with normal fastness

Pink:

Eosine, Phloxine, Erythrosine

Irisamine G }
Rosazeïne 6G, B } dyed direct or
 on a Turkey-
 red oil
 mordant

Red:

*Brilliant Croceïne M, R,
 B—9B

*Scarlet FR, F2R, F3R

*Croceïne AZ.

The dyestuffs marked with an
asterisk (*) possess very good
fastness to light.

Pink:

*Direct Rose T

Diamine Rose B extra, BD, GD,
BG, GGN, FFB, FFB extra

and the red dyestuffs given below in
light shades.

Red:

*Diamine Red 4B

Diamine Red 5B, 6B, 10B, D, DN
Cotton Red A

Diamine Purpurine B, 3B, V, 6B
Diamine Scarlet 3B

Diamine Fast Red F

Diamine Brilliant Scarlet S

*Diamine Fast Scarlet GG, GFF,
4BFF, 4BFS, 5BFF, 7BFF,
8BF, 8BN, 10BF.

Of better fastness to light:

Diamine Rose, all brands

Diamine Fast Red F

*Diamine Fast Scarlet }
GG, GFF, 4BFF, } aftertreated
4BFS, 5BFF, 7BFF } with copper
 sulphate

The colours marked with an
asterisk (*) possess the best fastness
to washing.

ON LOOSE COTTON AND COTTON YARN.

Of better fastness to washing
and milling

Resistant to acids*

Red:

To organic acids:

Primuline
Diamine Azo Scarlet
4B, 8B, A, B

} diazotised
and deve-
loped with
Beta
Naphtol

*Diamine Fast Scarlet GG, GFF,
4BFF, 4BFS, 5BFF, 7BFF,
8BF, 10BF, 8BN

Diamine Nitrazol Scarlet A,
coupled with Nitrazol C.

*Diamine Rose B extra, BD, BG,
GD, GGN, FFB, FFB extra

*Direct Rose T

*Diamine Brilliant Scarlet S

Diamine Scarlet 3B

Diamine Fast Red F

Diamine Purpurine B, 3B, V, 6B

With better fastness to light:

Pink and Red:

Safranine, all brands
Irisamine G
Rosazeïne 6G
shaded with
Thioflavine T, TCN
Paraphosphine
Diamond Phosphine
Tannin Orange R

} on a
tannin-
antimony
mordant

*Primuline
*Diamine Azo Scarlet
4B, 8B, A, B

} diazotised
and
developed
with
Beta Naphtol

*Irisamine G

*Rosazeïne 6G

} on a tannin-
antimony
mordant

*Paranitraniline Red.

Also for Red:

Diamine Fast Red F,
aftertreated with chrome salts.

The dyestuffs marked with an
asterisk (*) yield dyeings which resist
also dilute mineral acids.

With excellent fastness to washing
and light for cotton yarn:

Paranitraniline;
see directions on page 73.

Primuline, Diamine Azo Scarlet
and Paranitraniline Red likewise resist
acid cross-dyeing.

* For particulars of dyeing shot
effects fast to acids see page 87.

DYESTUFFS FOR VIOLET AND CLARET

<p>Simplest method of production, with normal fastness</p>	<p>Of better fastness to light</p>
<p style="text-align: center;"><u>Violet:</u></p> <p>Diamine Violet N, BB, RB Diamine Brilliant Violet B, RR Oxy Diamine Violet B, G, R, BF Diamine Heliotrope B, G, O.</p> <p style="text-align: center;"><u>Claret:</u></p> <p>Diamine Bordeaux B, S, BR, VRO Diamine Brilliant Bordeaux R Diamine Brilliant Rubine S Diamine Violet Red.</p> <p>The following products are useful for shading or saddening:</p> <p>Diamine Red 4B, 10B Oxy Diamine Orange G, R Oxy Diamine Blue 3R Diamine Black BH Oxy Diamine Black A.</p> <p>These dyeings are frequently brightened by topping with Basic Colours (Methyl Violet, Tannin Heliotrope, Magenta, Safranline, etc.)</p>	<p style="text-align: center;"><u>Violet:</u></p> <p>Diamine Fast Violet FFBN, or [FFRN] Diamine Fast Violet FFBN shaded with Diamine Brilliant Blue G } after-treated with copper sulphate Diamine Blue 3R } Diamine Brilliant Rubine S } Diamine Brilliant Bordeaux R }</p> <p style="text-align: center;"><u>Claret:</u></p> <p>Diamine Fast Bordeaux 6BS Diamine Bordeaux B, BR Diamine Brilliant Bordeaux R shaded with Diamine Fast Red F Diamine Violet N, BB</p> <p>Diamine Brilliant Rubine S, after-treated with copper sulphate shaded with Diamine Fast Orange ER, EG Diamine Fast Violet FFBN.</p> <p>The brightest shades of purple and claret are produced with</p> <p>Tannin Heliotrope Safranline } on a tannin-anti-mony mordant shaded with New Methylene Blue N } Paraphosphine R }</p>

ON LOOSE COTTON AND COTTON YARN.

Of better fastness to washing
and milling

Very fast to washing and milling.
The dyestuffs marked with an asterisk
(*) well resist acid cross-dyeing.

Violet:

Covered shades:

Diamine Azo Blue R, RR	} diazo- tised and deve- loped with Beta Naphтол
*Diaminogene Blue 6RN shaded with	
*Primuline or	
*Diamine Azo Bordeaux B	

Bright shades:

Tannin Heliotrope	} on a tannin- anti- mony mordant
New Methylene Blue 3R	
Methyl Violet 6B—4R	
*Crystal Violet 10B	

Claret:

Diamine Nitrazol Bordeaux GB,
coupled with Nitrazol O

*Diamine Azo Bordeaux B	} diazo- tised and deve- loped with Beta Naphтол
*Primuline shaded with	
*Diaminogene Blue 6RN or	
*Diamine Black BH	

*Primuline shaded with	} diazo- tised and develop- ed with Bor- deaux Deve- loper
*Diamine Black BH	

Combinations of

Safranine	} on a tannin- anti- mony mordant
Tannin Heliotrope	
New Methylene Blue	
Thioflavine T	
Paraphosphine R	

The products marked with an
asterisk (*) also resist acid cross-dyeing.

Violet:

*Immedial Indone Violet
B conc.
Immedial Violet C, CB, CR
*Immedial Prune S
Immedial Maroon B conc.
Immedial Purple C, after-
treated with sulphate of copper.

Claret:

Immedial Bordeaux G conc.,
GF conc.
Immedial Purple C
Immedial Maroon B conc.
Immedial Red Brown 3R.

Dyed according to directions on
page 33 and 34.

Of the above dyestuffs the follow-
ing possess very good fastness to
light:

Immedial Indone Violet
B conc.
Immedial Maroon B conc.
Immedial Bordeaux G conc.,
further: GF conc.
Immedial Purple C, after-
treated with sulphate of copper.

The dyeings are frequently
brightened with Basic Colours, e. g.

Tannin Heliotrope
Safranine
Methyl Violet, etc.

When using large quantities of
Basic Colours for topping, it is well
after bottoming with Immedial
Colours to mordant with tannin-
antimony in the customary manner
in order to better fix the Basic
Colours.

* For particulars of dyeing shot
effects fast to acids see page 87.

Simplest method of production, with normal fastness

For bright light blue shades:

Diamine Pure Blue A	Diamine Blue 3B, RW
Diamine Sky Blue, FF, FFN, FFS	Diamine Brilliant Blue G.
Oxy Diamine Blue 3G, 5G	

For medium and deep blues:

Diamine Blue 2B, BG, BX, NC, AZ, 3R	Diamine Azo Blue R, RR, No. 51, 54
Diamine New Blue G, R	Diamine Steel Blue L
Diamine Blue No. 50, 52, 53, 55, 56	Diamineral Blue R, B, BF, 3B, CV, CVB, 3RC
Oxy Diamine Blue G, B, R, 3R	Diamine Dark Blue B
Diamine Bengal Blue R, G	Diamine Black BH
Diamine Deep Blue R, B	

shaded if necessary with

Oxy Diamine Violet B or Oxy Diamine Black A, JW.

The following products are used for the *production of very bright Blues* of inferior fastness to washing and water:

Isamine Blue 8B, 6B, B, R (directions for dyeing see page 54)	
Water Blue B, RB, R	
Pure Soluble Blue	
Methyl Blue for Cotton	
Blue JBP, JB, BS, FS, RRS	
Alkaline Blue 3R—6R	

} directions for dyeing see page 53.

Of very good fastness to light

For light shades of brilliant Blues:

Diamine Fast Brilliant Blue R

or

Diamine Sky Blue FF, FFS

Diamine Brilliant Blue G

Diamine Blue RW

Diamine New Blue R

Oxy Diamine Blue 5G, 3G

} aftertreated with
copper sulphate

For medium and dark Blues:

Diamine Fast Blue FFB, FFG, G, BN

or

Diamineral Blue 3B, B, BF, R, CV, CVB

Diamine Bengal Blue G, R

Diamine Deep Blue B, R

Diamine Blue 3R

Diamine New Blue R

Diamine Dark Blue B

Oxy Diamine Blue G, B, R, 3R

} aftertreated with
copper sulphate

The dyeings are frequently topped with Basic Colours, especially with Methylene Blue, New Methylene Blue, Methyl Violet, Crystal Violet, Indazine, and Naphthindone.

Very fast to washing and milling

For light Blues of very good fastness to light:

Diamine Sky Blue FF, FFN, FFS	}	aftertreated with copper sulphate
Diamine Brilliant Blue G		
Diamine Blue RW		
Immedial Sky Blue paste	}	died according to directions on page 27, after- treated with bichrome and copper sulphate
Immedial Sky Blue powder conc.		
*Diaminogene Sky Blue N	}	diazotised and developed with Beta Naphtol.
Diaminogene Blue G		

For very bright shades of Blue:

New Methylene Blue *GG, *GB, *N, *NX, *R, 3R
on a tannin-antimony mordant.

For medium and deep shades of Blue:

Diamine Azo Blue R, 2R, 6B	}	diazotised and developed with Beta Naphtol or Naphtylamine Ether N
*Diamine Black BH, BO, RO		
*Diamine Heliotrope B, G, O		
*Oxy Diamine Violet BF		
or		
Methylindone B, R	}	on a tannin-antimony mordant
Indazine M		
Metaphenylene Blue B, BB, BBR, R		
Naphtiudone BB, BR, T		

For medium and deep shades of Blue of very good fastness to light:

*Diaminogene Blue BB, NB, NA, 2RN, 3RN, 6RN,	}	aftertreated with bichrome and copper sulphate.

The dyestuffs marked with an asterisk (*) are also fast to acid cross-dyeing.

Exceedingly fast to light, washing and milling, and withstanding acid cross-dyeing

For brighter shades of Blue:

Immedial Indone 4B conc., 3B conc., B conc., BBF conc.,
BF conc., R conc., RR conc., BN conc., JBN conc.,
JBF conc., RG conc.

Immedial Indogene GCL conc., BCL conc., RCL conc.,
RRCL conc., *B conc.

*Immedial New Blue G conc., developed by the various methods.

For more covered shades of Blue:

Immedial Indone RB conc.

Immedial Direct Blue B, JB, R, *OD, B extra conc.,
JB extra conc., BB extra conc., 4B extra conc.,
JND extra conc.

Immedial Dark Blue CRV, J

Immedial Blue C, CB, CR single strength and concentrated
brands, developed by the various methods.

For shading, the following may be used:

Immedial Green Blue CV	Immedial Indone Violet B conc.
Immedial Green BB extra	Immedial Black V extra
Immedial Deep Green G	Immedial Brilliant Carbon F,
Immedial Prune S	Immedial Carbon B. [FG

For instructions for dyeing and developing see pages 27—31.

The dyestuffs of the various groups may be combined at will.
The dyeing method suitable for the product prevalent in the combination is usually followed.

Best fastness to washing and light combined with excellent
fastness to chloring and bleaching, and resistance to acid cross-dyeing.

Hydron Blue G in powder and paste form	} For dyeing directions see page 42.
Hydron Blue R in powder and paste form	

* The products marked with an asterisk (*) must after the acid cross-dyeing be rinsed in a weakly alkaline bath.

For particulars of dyeing shot effects fast to acids see page 87.

DYESTUFFS FOR PRODUCING GREEN AND OLIVE

**Simplest method of production
with normal fastness**

Diamine Green B, BO, BZ, G, FG,
Diamine Dark Green N [CL

shaded with

Diamine Fast Yellow B, FF,
A, AR, AGG

Diamine Yellow CP

Oxy Diamine Orange G, R.

For saddening, the following are used:

Diamine Black BH, HW or

Oxy Diamine Black JE, JEI.

For brighter shades of Green:

Combinations of

Diamine Sky Blue, FF, FFN,

Diamine Pure Blue A [FFS

Oxy Diamine Blue 3G, 5G

Thioflavine S

Oxy Diamine Yellow GG, TZ

Diamine Fast Yellow FF, AGG.

For full, deep shades of Olive:

Combinations of

Diamine Green B, BO, BZ, G, FG,

Diamine Dark Green N [CL

shaded with

Diamine Yellow CP

Diamine Fast Yellow A, AR

Oxy Diamine Orange G, R

Diamine Bronze Brown PE

Oxy Diamine Brown G, 3GN

saddened with

Oxy Diamine Black JE, JEI

Diamine Black BH, HW.

Of very good fastness to light

For pale shades of Green:

Diamine Sky Blue

FF, FFN, FFS

Oxy Diamine Blue

3G, 5G

in combination with

Diamine Fast Yellow

FF, 3G*

Diamine Yellow CP

after-
treated
with
copper
sulphate

For covered shades of Green

and Olive:

Combinations of

Diamine Fast Brilliant Blue R

Diamine Fast Blue FFB,

FFG, G

Diamine Fast Yellow FF, B,

A, AGG

Diamine Yellow CP

Diamine Fast Orange EG, ER

Diamine Fast Brown G, R

or,

Combinations of

Diamine Sky Blue

FF, FFN, FFS

Diamine Blue RW

Diamine Bengal Blue G

Diamineral Blue R, BF

Diamine Fast Yellow

B, FF, A

Diamine Orange B

Diamine Brown 3G

Diamineral Brown G

after-
treated
with
copper
sul-
phate

* Combinations with Diamine Fast Yellow 3G are to best advantage dyed in water as soft as possible with the addition of soap and phosphate of soda.

ON LOOSE COTTON AND COTTON YARN.

Of better fastness to washing
and milling

For more covered shades of Green
and Olive:

Diamine Nitrazol Green BB, GF, S
coupled with Nitrazol C
Diamine Green G aftertreated
with chrome salts.

Diamine Bengal Blue	} aftertreated with bichrome and copper sulphate
G, R	
Diamineral Blue R	
Diamine Fast Yellow	
FF, A	
Diamineral Brown G	

For brighter shades of Green
and Olive:

Diamine Sky Blue FF,	} aftertreated with copper sulphate
FFN, FFS	
Diamine Blue RW	
shaded with	
Diamine Fast Yellow	
B, FF, A, AGG, 3G	

The dyeings aftertreated with sulphate of copper, or with bichrome and copper, are also exceedingly fast to light.

For very bright shades of Green:

*Brilliant Green	} on a tannin- antimony mordant
*Solid Green	
shaded with	
*Thioflavine T, TCN	
*Diamond Phosphine	
the last-named dyestuffs also in combination with	
*New Methylene Blue	
GG	
Methylene Blue BB	

The products marked with an asterisk (*) are also resistant to acid cross-dyeing.

Exceedingly fast to light,
washing and milling, and resisting
acid cross-dyeing*

For bright yellowish green shades:

Immedial Brilliant Green
G extra
Immedial Green GG extra,
GGX conc.
shaded with
Immedial Yellow Olive 5G
Immedial Yellow GG, D.

For bright blue-greens:

Immedial Green BB extra,
BBX conc.
Immedial Green Blue CV
shaded with
Immedial Indogene GCL conc.

For full, covered shades of Green
and Olive:

Immedial Green BBXN conc.
Immedial Deep Green G
Immedial Green Blue CV
Immedial Dark Green B
Immedial Olive B, GG, 3G
Immedial Yellow Olive G, 5G,
the following being used for shading:
Immedial Cutch G, O, BG, BGG
Immedial Dark Brown D conc.
Immedial Direct Blue B.

Dyed according to the directions
on page 32.

For increasing the brightness,
the dyeings are frequently topped
with Basic Colours (Brilliant Green,
Thioflavine. Paraphosphine, etc.),
the topping being done, if necessary,
after previous mordanting with
tannin and antimony.

* For particulars of dyeing
shot effect fast to acids see page 87.

**Simplest method of production,
with normal fastness**

Of better fastness to light

Blue-blacks:

Oxy Diamine Black A, SA, FFC,
JW, JWF, JWB extra conc.,
JWN extra conc.
Para Diamine Black B, BB, FF,
FFA, FFB, FFD extra conc.

Greenish Blacks:

Oxy Diamine Black JE, JEI, JB,
D, AT, UI
Oxy Diamine Carbon JB, JEI.

Very covered shades of Black:

Oxy Diamine Black AM, FFN,
FM extra conc., US, RR.

Direct shades of Black well resisting
acid cross-dyeing of union goods:

Oxy Diamine Black UI, US, SA
Para Diamine Black BB, FFB,
FFD extra conc.

The following are used chiefly for
mercerised yarns:

Oxy Diamine Black JEI, JB,
JW, JWF
Para Diamine Black FFB,
FFD extra conc.
Oxy Diamine Carbon JB, JEI
topped if necessary with
Methylene Blue BB or
Brilliant Green crystals extra.

*The "concentrated" brands of
Oxy Diamine Black and Para
Diamine Black have the same pro-
perties as the single strength brands,
but possess considerably greater
tinctorial power.*

Oxy Diamine Black SOOO, B,
BM, NR.

The following are particularly
fast to light:

Diamine Fast Black F, X,
XN extra conc.
Diamine Jet Black OO, Cr,
RB, SS

or

Diamineral Black B, 3B, 6B,
aftertreated with bichrome and
copper sulphate.

For mercerised yarns, the fol-
lowing are used:

Diamine Fast Black F, X,
XN extra conc.

or, possessing at the same time
good fastness to washing and
milling:

Diaminogene extra	} diazotised and developed with Phenylene Diamine, Resorcline or Beta Naphtol, or combina- tions of these developers.
Diaminogene B,	
BR, BW, CCL	
Oxy Diaminogene	
OB, OT, ED, EF,	
EM, FFG, FFN	
Diamine Black	
DB, DN	

ON LOOSE COTTON AND COTTON YARN.

Of very good fastness to washing
and milling

Exceedingly fast to light,
washing and milling, and resisting
acid cross-dyeing

*Diamine Nitrazol } coupled with
Black B, BB } Nitrazol, with
*Oxy Diamine Black } an addition, if
A, D, JW, JEI } required, of
Methylene
Blue BB
Oxy Diamine Black }
UI, US, SA, JEI, }
JW, JWF } aftertreated
Para Diamine Black, } with formal-
all brands } dehyde and
Diamine Fast Black } bichrome
X, XN extra conc. }

*Diamine Black BH } diazotised
*Diamine Azo Black B } and devel-
oped with
Phenylene
Diamine, or
combinations
of this
developer
with
Resorcine, or
Beta Naphtol
Diamine Beta Black B, BB, dia-
zotised and developed with Beta Naphtol.

All the Immedial Blacks, Immedial
Brilliant Blacks, Immedial Carbons
and Immedial Brilliant Carbons.

Very bluish blacks:

Immedial Black }
V extra } dyed
Immedial Brilliant } direct or
Black 5BV conc. } after-
Immedial Brilliant } treated
Carbon F } with bi-
chrome

Blue-blacks:

Immedial Black }
FF extra }
Immedial Brilliant } dyed
Black B, 6BG conc. } direct or
Immedial Black NB, } after-
NF, NBB conc., } treated
BF conc. } with bi-
Immedial Brilliant } chrome
Carbon FB, FG }

Of very good fastness to washing
and light:

*Diaminogene extra, B } diazotised
BR, BW, CCL } and devel-
oped with
Phenylene
Diamine,
*Oxy Diaminogene, } Resorcine, or
all brands } Beta Naphtol,
or
Diamine Black } combinations
DB, DN } of these
developers
Diamine Jet Black }
OO, Cr, RB, SS } aftertreated
Diamine Fast Black } with
X } bichrome
Diamineral Black }
B, 3B, 6B } aftertreated
Diamine Fast Black } with
F } bichrome
and copper
sulphate

Greenish blacks:

Immedial Black G extra
Immedial Brilliant Black
SBG conc.
Immedial Black NG, NNG conc.
Immedial Carbon B, KBG.

Very deep, covered Blacks:

Immedial Black NNR conc.,
NLN conc., NNZ conc.
Immedial Carbon JHJ, R,
BL, KBL.

Dyed according to the instructions
on pages 25 and 26.

Indo Carbon S, SE, especially for
warps in unions fast to acids
and stoving, and for yarns to
be brightened with acids (see
page 26).

The dyestuffs marked with an asterisk
(*) resist acid cross-dyeing very well.

The same dyestuffs are used also
for mercerised yarns.

BRIGHTENING THE DYEINGS.

Cotton yarns, knitted goods, hosiery, etc. are frequently subjected to a brightening process, both in order to impart to them a certain kind of handle and also to brighten the shade.

BRIGHTENING WITH SOAP.

The brightening is carried out most frequently with soap or Monosolvol with the object of obtaining both a softer handle and a clearer shade.

A cold or lukewarm bath is prepared with water as free from lime as possible, to which are added per 10 gallons:

$\frac{3}{4}$ oz soda ash	{	boiled together in hot water.
3—8 oz soap		

The cotton is worked therein for a few minutes, whizzed, and then dried without rinsing.

BRIGHTENING WITH AN EMULSION OF OIL.

This brightening is applied chiefly for Blacks; the dyeings not only gain thereby considerably in fulness and depth of shade, but also acquire a much softer handle.

This brightening is also useful if the shades have been dyed too deep and thereby appear bronzy; in such cases $1\frac{1}{2}$ —3 oz glue previously soaked in cold water are added to the bath in addition to the following weights.

The ingredients per 10 gallons liquor are approximately;

3	—8	oz neutral soap
$1\frac{1}{2}$	— $4\frac{1}{2}$	oz olive oil
$\frac{3}{4}$	— $1\frac{1}{2}$	oz soda.

To commence with, they are boiled well for 20 or 30 minutes with 1—2 gallons of water as free from lime as possible, and are then added to the bath for which as soft water as possible should also be used.

In this bath the yarns are treated for 15 to 20 minutes, whereupon they are whizzed without rinsing, and dried.

BRIGHTENING WITH STARCH, GLUE AND FAT.

This method is applied chiefly for dyeings of Blacks on cotton yarn in such cases where the shade is to be brightened but where the handle is not required to be soft; this treatment can also be carried out in hard water.

PRODUCING A SILKY SCROOP.

The yarn is treated for about 20 minutes in a boiling hot bath charged per 10 gallons with

$1\frac{1}{2}$ —3 oz potato or wheat starch
 $1\frac{1}{2}$ — $2\frac{1}{4}$ oz glue
3 — $4\frac{1}{2}$ oz lard or cocoa-nut butter,

whizzed, and dried without rinsing.

For blacks dyed with Immedial Blacks, such with Indo Carbon excepted 3—5 oz acetate or formate of soda per 10 gallons of liquor are added.

The starch is first stirred up with cold water and the glue soaked in cold water; the two are then boiled together, the lard or cocoa-nut oil and the acetate of soda being then added.

PRODUCING A SILKY SCROOP.

a) Dyeings on Bleached Yarn.

The dyed yarn, after being rinsed and whizzed, is turned for a few minutes in a cold to lukewarm bath containing

$\frac{1}{2}$ —1 lb olive-oil soap per 10 gallons,
lifted, and the liquor allowed to drain off a little.

It is then entered into a second, cold bath containing

$\frac{1}{2}$ —2 lbs acetic acid of 30% or
3 —8 oz formic acid of 85% per 10 gallons,
or, if a specially permanent scroop be desired,

3 —8 oz lactic or tartaric acid per 10 gallons.

The yarn is worked in this bath for about 10 minutes, whizzed, and dried as hot as possible.

In the case of light shades produced with Diamine Colours, the soap is frequently added to the dyebath, the goods being then, without rinsing, soured off with acetic or formic acid.

b) Dyeings on Unbleached Yarn.

The method employed for bleached yarns applies as a rule also for unbleached yarns, especially if they are dyed with Basic Colours.

A superior handle is produced by the following treatment:

The dyed yarn, after being rinsed and whizzed, is entered into a cold to lukewarm bath containing

$\frac{1}{2}$ —1 lb olive-oil soap per 10 gallons,
treated for a few minutes in this bath. lifted, and allowed to drain.

It is then worked for 10 to 15 minutes in a fresh, cold bath charged per 10 gallons with

3 —8 oz formic acid of 85%	} or 5—8 oz lactic or tartaric acid for producing a specially good handle
$1\frac{1}{2}$ — $4\frac{1}{2}$ oz lactic or tartaric acid	
$1\frac{1}{2}$ — $2\frac{1}{4}$ oz glue and	
$1\frac{1}{2}$ — $2\frac{1}{4}$ oz potato starch,	

whizzed, and dried as hot as possible.

The potato starch is first stirred up with cold water and the glue soaked in cold water, whereupon the two are boiled together.

The scroopy feel may be further improved by boiling the yarns with about 5% soda ash and 5% soap previous to dyeing; on bleached yarn a stronger silky scroop is always obtained than on raw yarn.

The most permanent scroop is obtained in the case of Diamine and Immedial Colours by treating the yarn after dyeing and rinsing with 2—3% tannic acid and 1— $1\frac{1}{2}$ % antimony salts, and then proceeding as described above.

For dyeings of *Immedial Black* and *Immedial Carbon* about 1 lb acetate or formate of soda should be added to the acid bath per 10 gallons. See page 36.

PRODUCING THE HANDLE PECULIAR TO ONE-BATH ANILINE BLACK.

Our *Immedial Blacks* and *Immedial Carbons* have been adopted quite generally as substitutes for One-Bath Aniline Black; these dyes are distinguished as compared with Aniline Black both for their much superior fastness to rubbing and for their excellent fastness to light and acids.

To impart to dyeings of Immedial Black the handle peculiar to One-Bath Aniline Black, which in certain cases is specially asked for, the cotton is treated as follows:

The dyed goods, after being well rinsed, are taken through a hot bath charged with 3—5 oz soap per 10 gallons, lifted, and after draining turned for a short

time in a lukewarm bath charged with 5—8 oz alum and 5—8 oz acetate of soda per 10 gallons; they are then wrung off, or whizzed, and dried.

PRODUCING THE HANDLE PECULIAR TO DYEINGS OF CUTCH.

The various brands of *Immedial Brown* and *Immedial Cutch* have been taken up largely as substitutes for Cutch, owing to their excellent properties of fastness and on account of the soft handle they impart to the goods in dyeing.

In certain cases, however, the peculiar hard handle of Cutch dyeings is asked for, and may be obtained with *Immedial Colours* in the following manner:

The yarns are dyed in the customary manner with *Immedial Brown* or *Immedial Cutch*, rinsed well, turned for a few minutes in a bath charged with 3—5% alum (reckoned on the weight of the goods), and then dried without rinsing again.

If the dyeings are aftertreated with bichrome and copper sulphate, the alum is added straight to the bath used for the aftertreatment, the yarn in such case also being dried without rinsing again.

DYEINGS FAST TO WATER.

Dyeings perfectly fast to water are obtained with the *Immedial Colours*; dyeings produced with *Diamine Colours* and aftertreated with metallic salts developed or coupled, and with *Basic Colours* on a tannin-antimony mordant, will in most cases also be found fully sufficient.

Diamine Colours, dyed direct, will in light shades likewise answer most requirements for resistance to water, but deep shades require an aftertreatment with alumina salts, if special demands are made in this direction.

The following method may in every instance be successfully applied for increasing the resistance to water of dyeings on cotton:

The dyed yarn is well rinsed and entered into a lukewarm bath containing 5 lbs acetate of alumina of 4^o Tw. or 5—6 oz sulphate of alumina, or again 8 oz alum, per 10 gallons liquor, and turned therein for 10 to 20 minutes, then whizzed, and dried without rinsing.

For dyeings which are aftertreated, the alumina salt may be added straight to the bath used for the aftertreatment, but the cotton must not be rinsed again in view of the desired resistance to water.

Dyeings rendered duller by the treatment with alum, for instance dyeings of Diamine Red 4B—10B, may be brightened after the alumina bath with a little soap, silicate of soda or soda, the original shade returning by such treatment without the resistance to water being in any way affected.

WEIGHTING OF COTTON.

As a rule, the cotton is not affected in weight by dyeing with *Diamine Colours* or *Immedial Colours*; on the other hand the aftertreatment with metallic salts, particularly in the dyeing of *Immedial Colours*, effects a slight increase in the weight of cotton. In a like manner an increase in the weight by 2—5% according to the quantity of mordant used, is effected with *Basic Colours* dyed on tannin and antimony or iron mordant.

Artificial weighting is effected in the finish by adding mineral filling material to the finishing paste. Loose cotton and cotton hanks, however, are sometimes after-treated for this purpose with certain salts.

The following salts are mostly employed for weighting cotton goods:

Magnesium sulphate (Epsom salts),
Zinc sulphate,
Barium chloride,
Calcium chloride,

the increase in weight amounting to about 8—12% if solutions of 8—10 lbs of these substances per 10 gallons are used.

Magnesium sulphate is best for this purpose, the following liquor being frequently used for weighting:

For 100 lbs of cotton:
approximately 160 gallons water,
80—120 lbs magnesium sulphate,
16 lbs dextrine,
{ 4 lbs rape-seed oil, saponified with
{ 1 lb soda.

For dyeings of *Immedial Black* and *Immedial Carbon*, 12—16 lbs acetate or formate of soda are besides added. The cotton is worked for a few minutes in the lukewarm bath, then whizzed, and dried.

In some instances a little glycerine may be added to the bath in the place of rape-seed oil and soda in order to facilitate the absorption of moisture.

Glucose (treacle) is frequently used in addition to the above named salts; but this may have an unfavourable influence on some shades.

For *black yarns*, a weighting with sumac and iron is frequently resorted to, whereby the shade gains in depth and fulness.

The hanks are first entered into a bath containing 15—20% sumac extract, and kept therein for several hours, then wrung off or whizzed, and treated in a bath of pyrolignite of iron of 3—5° Tw., and rinsed; in the case of *Immedial Black* and *Immedial Carbon*, 5—8 oz acetate or formate of soda per 10 gallons rinsing liquor are added.

The increase in weight, when employing the last-named method, amounts to about 7—8%.

MACHINE-DYEING.

MACHINE-DYEING.

Loose cotton, cotton yarn and cotton knit goods may be dyed in any kind of bark, kettle, or dyeing machine. Roving, sliver, cheeses and cops are always dyed in dyeing machines, and warps also to a very large extent. The following are the principal systems of dyeing machines or apparatus in use generally:

1. Packing System. The goods to be dyed are packed as tightly and evenly as possible in the receptacle, the liquor being then forced through the goods by means of a pump, or in some instances with a steam injector.

2. Spindle System. The goods, in form of cheeses, cops etc., are fixed on to hollow perforated spindles, the liquor being circulated through the goods by means of a pump or also by suction (vacuum) combined with air pressure or steam pressure.

3. Warp-Dyeing on the Beam. Machines for this purpose resemble those of the packing and spindle systems; the beams are sometimes dyed in closed, and then again in open, apparatus, the liquor being kept in circulation by means of a pump or by air pressure and suction.

4. Froth-Dyeing. The liquor by severe heating is got into a frothy state, and the goods, without coming into contact with the liquor itself, are treated in the part of the apparatus which is filled with froth.

5. Continuous Dyeing Machines. The dyeing by this system is carried out by means of short passages through the unmoved liquor. This method is in some cases employed for sliver, but principally for warp-dyeing, as described in the following chapter.

Regarding the dyeing of cotton in its different stages of manufacture, we would like to offer the following remarks:

LOOSE COTTON.

Loose cotton is dyed exclusively by the packing system, the material being pressed tightly into the receptacle for dyeing. Frequently water is run on to the cotton, which ensures tighter packing and allows of handling larger quantities of cotton.

SLIVER AND ROVING.

These are dyed in a variety of forms as indicated below, care being taken not to boil severely, but always to maintain a temperature rather below the boil or of about 80—90° C. (175—195° F.).

a) In *loosely wound balls*, in the same kind of machines and in the same manner as loose cotton. Through each ball a thread is passed. The balls may be lifted out by means of this thread so as to avoid injuring them in any way. They are frequently also hung up to dry by these threads.

b) In *cylinders*. In this case the sliver is made to run straight into a perforated cylinder, a number of which are then placed in the apparatus. The liquor is pumped through the perforated walls of the cylinders.

c) In the *shape of bobbins*, particularly as roving in the form of so-called *Flyer-Sloeving bobbins*, on spindles; the material is in such case dried on the spindles.

d) As *sliver in one continuous passage*. As the dyeing takes place in very short passages, the dyebaths must be considerably more concentrated than usual. The particulars for dyeing warps (see next chapter) will serve as a guide here.

CHEESES AND COPS.

Cheeses as a rule are dyed in packing apparatus, but they are frequently also dyed in spindle and froth-dyeing apparatus.

Cops are dyed almost invariably and to best advantage in spindle apparatus: packing apparatus are only employed in some cases.

Cheeses to be dyed in packing apparatus must be packed as tightly and evenly as possible in order to avoid

the forming of channels. Interstices forming during the packing must be well filled up either with loose cotton or yarn which may be utilized afterwards in a dyed state or used repeatedly for several lots.

When dyeing in packing apparatus, the usual kind of unperforated paper tube may be used; care only has to be taken that, as frequently is the case, these tubes do not contain an excess of sulphate of alumina, which is apt to cause bronzy spots on the yarn. To prevent the tubes from becoming deformed by pressing, pins or tubes either of brass, nickel or nickeline are usually inserted in the paper tubes; these remain there during the whizzing, but are removed before drying.

When dyeing in spindle apparatus, the cops and bobbins are put on to perforated spindles, and the tubes in such cases must likewise be perforated. Cheeses are frequently wound straight on to the perforated metal spindles. For Diamine Colours, spindles either of brass, nickel or nickeline are usually employed; for Immedial Colours, only such of nickel or nickeline can be used. Iron spindles are not so well suited, as they are too prone to rust.

It sometimes occurs, more especially when dyeing cops, that cotton fibres clog the ends of the spindles, thus preventing an even penetration of the cops. The spindles must therefore be cleaned from time to time, for which purpose special appliances are now in use. Frequently the spindles are cleaned by heating in a soldering flame or a Bunsen burner, and beating subsequently, then rinsing them in the machine with hot water. In order to prevent the spindles from becoming clogged, the circulation of the liquor is also reversed in dyeing.

Regarding the dyeing of cheeses in the froth see particulars in full on page 168.

COTTON HANK YARN.

Cotton hank yarn is dyed in machines for staple shades principally, like Black, Brown, etc. The dyeing is usually done in packing apparatus with a pump in the same way as for loose cotton. Here too care has to be taken that the goods are evenly and tightly packed.

WARPS.

Warps are dyed in different ways, viz,

a) continuously in a warp-dyeing machine (see the chapter on warp-dyeing),

b) in apparatus, on a perforated beam, on which the warps are dyed in the same way as cops.

c) in packing apparatus, the warps being packed into the apparatus and dyed in the same way as cotton hanks.

MERCERISED YARN

is rarely dyed in machines, and only for the production of Blacks. The dyeing is carried out with a very small amount of salt.

KNIT GOODS (STOCKINGS AND HOSIERY).

Knit goods are mostly dyed in open vats in the manner described in the special chapter on this subject.

Of late, however, knit goods are being dyed also in mechanical apparatus; Blacks principally with Diamine and Immedial Colours, and other staple shades with Diamine Colours. Packing machines are used, the stockings being packed as smoothly and evenly as possible in order to avoid any creases; hosiery goods are packed in tightly in the form of rolls. Any interstices forming are filled up with loose cotton and yarn in the same way as with cheeses and cops. The manner of working is the same as for other materials in packing apparatus.

COTTON AND ARTIFICIAL SILK EMBROIDERIES.

These are likewise in certain cases dyed in packing apparatus, which are employed mainly with a view to effecting penetration of thick embroidery work and preserving the quality of the material. The embroideries are rolled up evenly and placed in layers in the apparatus. The products best suited for dyeing artificial silk embroidery are indicated in the chapter on artificial silk.

QUALITY OF THE WATER.

It is of primary importance in machine-dyeing to use pure water as free from lime as possible. Calcareous water may also be used in many cases, but level results are ensured with greater certainty by working with soft water.

The supply of soft water depends so much upon local conditions that no hard and fast rules can be laid down as to how it can be obtained. It may however be mentioned that in a great many works a good supply of soft water is easily procurable for the moderate requirements in machine-dyeing by merely collecting the condensed water which is to be obtained in every dyehouse. Where a sufficiency of condensed or other soft water is not available, a water-purifier of the kinds constructed by numerous engineering firms should be provided.

QUALITY OF THE CHEMICALS.

Special care should also be taken to use ingredients like Glauber's salt and sodium sulphide in a sufficient degree of purity.

For machine-dyeing, it is best to use the crystallised products. For light shades it is advantageous to prepare a stock solution of sodium sulphide, which is allowed to settle overnight previous to use (see page 4).

I. DYEING IN PACKING AND SPINDLE APPARATUS.

PREPARATION FOR THE DYEING.

In machine-dyeing, it is not as a rule necessary to boil or wet the material beforehand: only when dyeing at a low temperature is it advisable to wet the material beforehand for $\frac{1}{4}$ to $\frac{1}{2}$ hour boiling hot. If good, soft water be available, it is best to wet with water containing $1\frac{1}{2}$ —3 oz Turkey-red oil, Monosolvol or soda ash per 10 gallons, but if the water is hard, the wetting is best done with plain water without the addition of any oil or alkali. After wetting, the goods are rinsed again in cold water in order to cool them off. For light bright shades the material is frequently bleached previously.

BLEACHING.

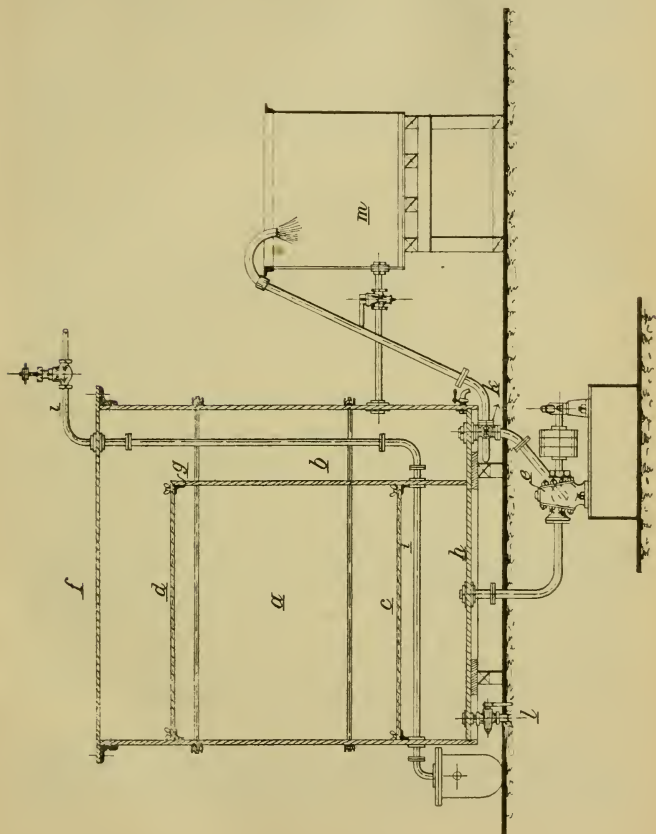
Loose cotton and cotton yarn are bleached either in vats of the same kind as are used for dyeing or in large cisterns of wood or cement. Frequently, however, loose cotton as well as roving, cops, cheeses, warps, etc. are bleached in the same or similar apparatus as are used for dyeing, such as are built by the various machine works. For bleaching, it is best to use apparatus of wood, lead or nickeline. It is very important also to use pure water, as only by this means is a good bleaching effect ensured. If none be available, one of the well-known water-purifiers should be provided.

A very useful plant for bleaching loose material, cotton yarn, sliver, cops and cheeses is shown on the next page.

The cotton is firmly packed into a rectangular vat, and by means of a pump fixed below the apparatus the liquor is forced through the goods to be bleached. On starting the operation, the liquor is pumped through the goods from below, and subsequently, it is worked alternately in both directions. A reservoir for the bleaching liquor is likewise attached, which, according to the space available, may either be fixed above or alongside of the bleaching apparatus.

The bleaching vessel proper (*a*) provided with a lattice bottom (*c*) and lattice cover (*d*), fastened by screws (*g*), stands in the larger vessel (*b*) which is covered with the lid (*f*) lying loosely on the top. The circulation of the

liquor is effected by the brass pump (*e*) which is connected by two pipes with the bottom (*h*) of vessel (*b*): the three-



way cock (*k*) is inserted into one of the pipes in order to allow of the bleaching liquor being pressed into the reser-

voir (*m*). The pump is provided with a double drive of three pulleys with open and crossed belts so that the pump can work alternately in two different directions. The steam-pipe (*i*) serves the purpose of heating the liquor. The kier is emptied through the discharge-cock (*l*).

The outer kier is about 6 feet high and the base measurements are 5 feet 3" by 5 feet 3". The inner kier is about 4 feet 2" in height with a base of 4 feet 7" by 4 feet 7", and stands about a foot higher than the bottom (*h*) of the outer kier.

The apparatus has a capacity of holding about 1000—1500 lbs material, and is used both for boiling and for the subsequent operations such as bleaching and souring.

For the bleaching proper, hypochlorite of soda is best used. The method of procedure is as follows:

The bleaching kier is filled as evenly as possible with the material to be bleached, and then covered up with the lattice lid. It is best to pack cops in separate smaller boxes fitting into the kier, which are open at the top and the bottoms of which are perforated. Hereafter the bowking liquor, containing 3—6 oz caustic soda lye of 77° Tw. per 10 gallons is run into box (*b*), and heated to the boil; it is then drawn by means of the pump from (*b*) to (*a*), and worked alternately by suction and pressure for 4 to 5 hours. The bowking liquor is then allowed to run off, and the goods are rinsed again once or twice. The bleaching liquor of hypochlorite of soda $\frac{3}{4}$ —1° Tw. is then run into the apparatus, allowed to act for 5 to 6 hours with alternate suction and pressure, and then pumped back into the reservoir; then the goods are rinsed once more, soured off in the same apparatus, likewise with alternate suction and pressure, for about an hour, with hydrochloric acid of about $\frac{1}{2}$ ° Tw., and finally rinsed again thoroughly.

In order to thoroughly remove the chlorine, the goods are frequently given finally a bath of 1½—3 oz bisulphite of 64° Tw. per 10 gallons. Special attention has to be paid to a thorough removal of the chlorine and acid.

When bleaching hanks, cops and cheeses, it is preferable to place a layer of loose cotton below and on top of the material to be bleached, particularly if perfectly clean water is not available.

BLUEING.

As cotton, even when bleached, still retains a more or less yellowish tone, it is necessary to blue it slightly. This blueing is done in the last rinsing bath, or, if the material is sized subsequently, by adding the dyestuff to the size.

For this purpose, either Alizarine Cyanole EF or Alizarine Cyanole Violet R is used, varying with the shade, either alone or together. A stock solution of about 8 oz dyestuff per 10 gallons is prepared with water as free from lime as possible, the requisite amount being added to the bath.

DRYING.

The method of drying has a great influence on the spinning properties of the bleached material. The same points have to be observed here as in drying after the dyeing, in which connection see page 171.

METHODS OF DYEING.

For machine-dyeing, Diamine, Immedial or Hydron Colours are used principally; in certain cases Basic Colours also are employed, mostly on a bottom either of Diamine or Immedial Colours.

The selection of dyestuffs and methods of dyeing varies with the shade and the requirements made in each individual case. Fuller particulars on this subject will be found in the tables on pages 148—167.

DYEING OF DIAMINE COLOURS.

The Diamine Colours are dyed to best advantage in copper or wooden machines, or machines made of nickeline; failing these, iron machines* may likewise be used, especially when dyeing dull or deep shades. In dyeing light

* To prevent rusting, iron apparatus, particularly if they have been used subsequently for any kind of acid treatment, are rinsed subsequently with a soda solution or put under water to which a little soda is added.

shades, it is preferable, especially when using iron machines, to line the interior with sack cloth or some kind of cotton cloth.

Very light shades are usually dyed without any addition whatsoever; for slightly deeper shades, 1—3% Glauber's salt crystals, or preferably, in its place, 2—5% phosphate of soda are added to exhaust the liquor.

Cotton yarn, cheeses, cops and warps are wetted out before dyeing in the case of light shades, as indicated on page 134, unless bleached material is used, the goods being entered into the lukewarm bath which is gradually raised to the boil. Loose cotton and sliver are usually dyed without wetting beforehand.

Medium and deep shades as a rule are dyed in a hot to boiling bath with the addition of 5—20% Glauber's salt, varying with the depth of shade, without being wetted or boiled previously; the best way is to add the dyestuff and one-half of the requisite amount of salt to commence with, the remainder of the salt being added $\frac{1}{4}$ to $\frac{1}{2}$ hour later, whereupon the dyeing is continued for another $\frac{1}{2}$ to 1 hour.

When dyeing in the standing bath, only the dyestuff is added at first, the salt being added $\frac{1}{4}$ to $\frac{1}{2}$ hour later.

For light shades the dyebaths are not usually preserved for further lots, but for medium and deep shades it is advisable to use standing baths, because the liquor does not exhaust entirely.

The additions to the standing baths are regulated by the volume of the liquor. For the ordinary volume of water, i. e. 8—10 times the weight of the material to be dyed, about three-quarters to two-thirds the original quantity of dyestuff is required, while for dilute liquor, one-half to two-thirds mostly proves sufficient. The additions of soda, soap, Turkey-red oil or Monosolvol and salt for the second and following lots should be about a quarter to one-fifth of the quantities used for the starting baths.

In dyeing subsequent lots, care must be taken that the quantity of salt in the bath does not unduly accumulate. The best way is to test the liquor from time to time with a hydrometer. The specific gravity should not exceed about 3—4° Tw. for medium, and about 5—7° Tw. for deep, shades. When this concentration is attained, the addition of salt should be suspended for the next few lots.

When dyeing very hard-twisted yarns, or tightly wound cheeses, cops or warp-beams in soft water, it is an advantage, particularly with difficult mode shades, to add 2—3% soap or 1—2% Turkey-red oil or Monosolvol to the bath. When using hard water, these additions are omitted.

Aftertreatment with Metallic Salts. The aftertreatment with chrome or alumina salts may be carried out in any kind of machine in accordance with the directions in the general part of this book on pages 10—12; an aftertreatment with sulphate of copper, or with sulphate of copper and bichrome, on the other hand, is not practicable in apparatus made of iron.

When aftertreating with metallic salts, the baths must be perfectly clear; any precipitate forming can be removed by increasing the addition of acetic acid.

Diazotising and Developing. For this purpose it is best to use wooden or copper machines, or machines made of nickeline. Apparatus of iron may likewise be used, but are apt to be affected by the diazotising.

The dyed goods are rinsed well, and then diazotised in a cold or lukewarm bath,

light and medium shades with		deep shades with	
1½—2%	nitrite of soda	2—3%	nitrite of soda
3	—5% hydrochloric acid	4—6%	hydrochloric acid
	32° Tw. or		32° Tw. or
2	—3% sulphuric acid	3—4%	sulphuric acid
	168° Tw.*		168° Tw.*

It may be stated that in a short liquor, for instance in most packing apparatus, less nitrite of soda and acid will be required than in a more dilute liquor.

First add the nitrite of soda previously dissolved in water, and allow same to act for 5 to 10 minutes; then add a small portion of the hydrochloric acid diluted with cold water, and five minutes later the remainder of the hydrochloric acid in several portions, diazotising in all about 20 or 30 minutes.

The diazotising bath is then run off, and the goods, after rinsing for a short time in the machine with cold water, are developed for 20 to 30 minutes.

Particulars for preparing the developing baths will be found in the general part, page 15.

* Sulphuric acid is used in iron and copper apparatus in particular, as it affects the metal less than hydrochloric acid.

For dyeing very hard-twisted yarn it is best to heat the diazotising and the developing baths up to 30° C. (85° F.). In very large apparatus the diazotising and developing processes may be prolonged particularly in the case of very hard-twisted material.

Coupling with Nitrazol C or Diazotised Paranitraniline.

The coupling may be done in any kind of apparatus, for preference without any other addition than 3—5% Nitrazol C or 5—8½ gallons of a solution of diazotised Paranitraniline (see page 19) per 100 lbs cotton, the treatment taking place for ½ to 1 hour in a cold bath.

It is best to add only a portion of the Nitrazol C or of the diazo solution to start with, the remainder being added in one or two separate portions, for preference while working the pump from the centre to outwards. After coupling, the goods are rinsed well, and may be soaped. Particulars of dissolving the Nitrazol C and preparing the solution of diazotised Paranitraniline will be found on pages 18 and 19.

Aftertreatment with Formaldehyde. This may be carried out in any kind of apparatus in accordance with the directions on page 20.

DYEING OF IMMEDIAL COLOURS.

Dyeing machines made of wood, iron* or nickeline are the best for dyeing Immedial Colours. Machines made of copper, or containing fittings of bronze, copper or brass (such as steam coils, pumps etc.) are not suitable.

In dyeing with Immedial Colours, air pressure owing to its oxidising action is less suitable than steam pressure. Hence, when working with air pressure, some more sodium sulphide must be used.

The circulation of the liquor should be so regulated as to avoid any irregular spouting, and the goods to be dyed should always be completely immersed in the liquor.

It is also very important to provide the machines with effective arrangements for suction or for pressing off and also for rinsing, that the liquor may be thoroughly drawn or pressed off after dyeing, and the goods well rinsed.

* See footnote on page 137.

Light shades as a rule are dyed with the addition of soda and sodium sulphide only and without any salt, and require comparatively much more sodium sulphide than dark shades. Yarns, cops, cheeses and warps are dyed in a warm to hot bath, the temperature of which is during the dyeing gradually raised to boiling heat. In this case it is recommended to boil or wet the material previously. Loose material as a rule is dyed boiling hot without any previous wetting.

Medium and deep shades are usually dyed boiling hot with soda and sodium sulphide without any previous wetting, and for deeper shades salt is added with a view to better exhaust the bath. Certain dyes are also dyed at a low temperature in order to obtain the greatest brightness possible; in such case the goods have to be wetted before dyeing.

Full directions for the dyeing will be found in the tables on pages 148—167.

It is an advantage when dyeing hard-twisted yarn or tightly wound material in soft water to add a little Turkey-red oil or Monosolvol (1—2% reckoned on the weight of the material for the first bath and $\frac{1}{4}$ — $\frac{1}{5}$ of these quantities for subsequent lots).

For light shades the dyebaths are not as a rule used over again; in the case of medium and deep shades the dyebaths do not become exhausted, and it is very useful therefore to preserve them for further lots.

The additions necessary for a normal volume of liquor are to be found in the directions in the tables on the following pages. It has to be observed however that the charging of the baths is regulated also according to the volume of the liquor; if very dilute, the starting baths should be correspondingly stronger, whilst for subsequent lots correspondingly smaller quantities should be added.

As in the case of the Diamine Colours, it is well to test the old baths from time to time by means of a hydrometer. For medium shades the density of the liquor should not exceed about 4° Tw. and for deep shades 7—8½° Tw. as a rule. When such density is attained, further additions of salt should be suspended for a while.

For Black on materials which are easily dyed through, this density may however be exceeded, particularly for dyeings on loose cotton (up to 12—15⁰ Tw.).

Rinsing after the Dyeing. In machine-dyeing, it is important, after the dyeing is complete, to free the goods as thoroughly as possible from liquor and finally to rinse well.

In using packing apparatus, and frequently also in the case of spindle apparatus, the liquor is removed by means of a pump, whereupon the goods as a rule are at once rinsed thoroughly.

When using a packing apparatus combined with a hydroextractor, a rinsing bath is first given with 3—5 oz sodium sulphide crystals per 10 gallons after the larger portion of the liquor has been pumped into the reservoir; thereupon the goods are whizzed, and only then is the rinsing completed.

When dyeing in spindle apparatus, the liquor is best removed by means of a vacuum which exercises a strong action. The customary method of working is to first remove the liquor from the dye vessel as well as from the pipes by means of a pump, air pressure or steam pressure, and then to draw off the liquor still remaining in the goods as quickly and thoroughly as possible by means of a vacuum, for which purpose a sufficiently strong vacuum must be available. Frequently also the receptacle holding the material is lifted from the liquor, the vacuum pump then being applied direct.

If it is not possible to sufficiently remove the liquor from the goods, it is an advantage to add 3—5 oz sodium sulphide per 10 gallons to the first rinsing bath, and then to slightly heat the bath, allowing it to act for about ten minutes.

It is always advisable when the requirements for levelness are exacting to apply the first and second rinsing baths lukewarm, adding some sodium sulphide each time.

In dyeing blue Immedial Colours in packing apparatus, the oxidation may be accelerated and the brightness enhanced by a treatment with bichrome and acetic acid, bichrome and bisulphite, or with Immedial Developer. For fuller particulars see the following pages and also pages 35—37 in the general part.

Immedial Blue and Immedial New Blue G conc. frequently are not rinsed after the dyeing, but are

developed by steaming or smothering after the liquor has been removed very thoroughly from the goods by means of suction, pressure or whizzing.

Developing by smothering is applied principally to loose cotton, sliver, roving, cheeses and beamed warps. The material is placed in skeps or some other suitable receptacle, and left for a few hours or overnight in a warm place, whereby the blue is developed. The developing by steaming may be effected either in the apparatus itself, to which an air injector is attached for the purpose, or in a special steam chest as described on pages 37—39.

AFTERTREATMENT WITH METALLIC SALTS.

a) Aftertreatment with Chrome Salts. This can be carried out in any kind of apparatus in accordance with the directions on page 35 of the general part.

b) Aftertreatment with Bichrome and Sulphate of Copper. This method is not applicable in iron apparatus, but may be applied in apparatus made of wood, copper, brass or nickeline. (Page 35).

If an iron apparatus has been used for dyeing and no other kind is available, the aftertreatment may be carried out with nickel sulphate and bichrome instead of copper sulphate and bichrome, which treatment can be applied in any kind of apparatus.

c) Aftertreatment with Nickel Sulphate and Bichrome. This aftertreatment yields a similar effect as an aftertreatment with copper sulphate and bichrome; for particulars see full directions in the general part (page 35).

d) Aftertreatment with Bichrome and Bisulphite. This method of aftertreatment is applied mainly with a view to increasing the brightness of blue Immedial Colours, particularly when dyeing in packing apparatus, and is applied in accordance with the directions in the general part (page 35).

AFTERTREATMENT WITH IMMEDIAL DEVELOPER.

This Developer is used for the following two purposes:

a) For oxidising dyeings produced with Immedial Indone, Immedial Indogene or Immedial Direct Blue, particularly when dyeing in packing apparatus.

b) For developing Immedial Blue and Immedial New Blue dyeings, as a substitute for developing by smothering or steaming.

These methods of developing may be carried out in any kind of machine; fuller particulars will be found in the general part, on page 37.

AFTERTREATMENT WITH ACETATE OR FORMATE OF SODA.

This treatment comes mainly into consideration for black dyeings, with the exception of those produced with Indo Carbon, and is necessary in all those cases in which no other alkaline brightening is given.

As a rule, 6—8 oz acetate or formate of soda are required per 10 gallons liquor, and after this liquor has been allowed to act for a little while, the goods are dried without being rinsed again.

For warps which are sized immediately after the dyeing, the acetate or formate of soda is added to the size.

Instead of acetate or formate of soda, 3—6 oz soda ash per 10 gallons may in many cases be used.

For further particulars on this subject see page 36.

DYEING WITH HYDRON COLOURS.

The Hydron Blues may be applied to equal advantage in apparatus as in vats, and the apparatus may consist of wood, copper, iron * or nickeline.

The goods must be wetted out before dyeing; when using hard water, they are wetted for about 20 to 30 minutes without any addition; when the water is soft, the wetting may be accelerated by adding a little soda, Turkey-red oil, Monosolvol, etc.

The dyeing is effected with the addition of hydrosulphite and caustic soda lye in accordance with the directions given below. For very light shades and on material difficult to penetrate, a little Turkey-red oil or Monosolvol may be added; for light shades moreover a little more hydrosulphite and lye are required than for deep shades.

* See footnote on page 137.

**DIRECTIONS FOR DYEING IN A VOLUME OF LIQUOR ABOUT
10 TO 15 TIMES THE WEIGHT OF THE GOODS.**

HYDRON BLUE G AND R POWDER.

<u>For light and medium shades:</u>	Starting bath:	Subsequent lots:
Dyestuff	0.4 — 3 %	0.4 — 2.4 %
Hydrosulphite conc. Powder	2½ — 7½ %	2 — 6 %
Caustic soda lye 77° Tw.	2½ — 7½ %	2 — 4 %
<u>For deep shades:</u>	Starting bath:	Subsequent lots:
Dyestuff	4 — 6 %	3 — 4.4 %
Hydrosulphite conc. Powder	10 — 15 %	7½ — 11 %
Caustic soda lye 77° Tw.	10 — 15 %	6 — 8 %

HYDRON BLUE G AND R PASTE 20%.

<u>For light and medium shades:</u>	Starting bath:	Subsequent lots:
Dyestuff	2 — 15 %	2 — 12 %
Hydrosulphite conc. Powder	2½ — 7½ %	2 — 6 %
Caustic soda lye 77° Tw.	2½ — 7½ %	2 — 4 %
<u>For deep shades:</u>	Starting bath:	Subsequent lots:
Dyestuff	20 — 30 %	15 — 22 %
Hydrosulphite conc. Powder	10 — 15 %	7½ — 11 %
Caustic soda lye 77° Tw.	10 — 15 %	6 — 8 %

Add the caustic soda lye and dyestuff at 50—60° C. (120—140° F.), stir in the hydrosulphite gradually in powder form, or to better advantage dissolved previously in cold water, and stir thoroughly until the liquor has turned completely yellow. Hereafter dye for ½ to 1 hour at 50—60° C. (120—140° F.).

During the dyeing with Hydron Blue the bath must be in a thoroughly reduced condition. The liquor should be golden yellow and not have a blue or greenish appearance. If the latter is the case, a little more hydrosulphite, and afterwards a little lye, if necessary, should be added.

Treatment after the Dyeing. When the dyeing is completed, the goods must be freed as far as possible from the liquor, which is removed from the goods either by pumping, whizzing or vacuum suction.

After dyeing in *packing apparatus*, the liquor is usually drawn off by means of a pump and pressed back into the reservoir, whereupon the goods are rinsed thoroughly first with warm and then with cold water. If a hydroextractor is combined with the packing apparatus, the goods are at first rinsed once, then hydroextracted, and after this rinsed again thoroughly.

When dyeing *in a spindle apparatus*, it is best to remove the liquor by vacuum, whereupon the goods are rinsed well. If the liquor cannot be drawn off sufficiently well by means of a vacuum, it is removed with a pump, whereupon the goods are submersed as quickly as possible in water in order to prevent the outer layers from oxidising. They are then rinsed until the liquor runs off clear. To enhance the effect of the rinsing, it is well to use warm water for this purpose.

The goods dyed *in a packing apparatus* (yarns, cheeses, or loose cotton) are to advantage left lying for some time exposed to the air after rinsing and whizzing, in order to oxidise.

In order to assist the oxidising, especially when working in packing apparatus, and to enhance the brightness of the dyeings, the goods may to advantage be subjected to the various methods of aftertreatment mentioned under Nos. 1 to 3 on page 44 of the general part, or aftertreated with sulphate of copper as stated on page 45 in order to still further increase their fastness.

COMBINATIONS OF HYDRON BLUE WITH OTHER DYESTUFFS.

- a) With Indigo and other Vat Colours,
- b) with Diamine, Immedial or Basic Colours.

For particulars pertaining thereto see directions on page 45 of the general part, and for Basic Colours see page 147.

BASIC COLOURS.

Basic Colours are usually dyed by topping Diamine, Immedial or Hydron Colours (see page 147), which is the most advantageous way for employing them in apparatus; applied in this way they may be dyed in machines made of any kind of material.

When dyeing on a tannin-antimony mordant, machines made of iron should not be used, and the goods should be wetted well, and mordanted evenly, but not too heavily; the dyeing proper should further be retarded by adding the previously well dissolved dyestuff gradually, and increasing the quantity of acid.

Before dyeing, the goods are wetted for 15 to 30 minutes in a boiling bath, to which, when using soft water, some Turkey-red oil or Monosolvol should be added.

The mordanting is carried out in a hot bath with 2—5% tannic acid, according to the depth of shade. After mordanting, the liquor is removed well, either by suction, pressing or whizzing, the dyeings being then fixed in a cold bath with $1\frac{1}{2}$ —3% tartar emetic or antimony salts, and rinsed thoroughly.

When dyeing light shades, it is an advantage after the mordanting to give the goods a short rinsing in cold water, and only then to fix with tartar emetic or antimony salts.

When using hard water, it is well to add some acetic acid to the tannin bath.

As soft water as can be had should be used for dyeing, condensed water being best suited; hard water should be corrected with a little acetic acid. The bath is first charged with 3—4% acetic acid or an equal quantity of sulphate of alumina, the dyestuff solution being then added gradually through a filter.

The dyeing is carried out in a cold to lukewarm bath; not until the bath is fairly well exhausted is the temperature *gradually* increased, if necessary to the boil. After dyeing, the goods are rinsed thoroughly.

ISAMINE BLUE.

Isamine Blue may be dyed in any kind of dyeing machine.

Dye in a hot bath for $\frac{1}{2}$ hour with about 2% acetic acid and, according to the depth of shade, with $\frac{1}{2}$ —3 lbs Glauber's salt crystals per 10 gallons liquor; then rinse cold.

BOTTOMING WITH DIAMINE, IMMEDIAL OR HYDRON COLOURS, AND TOPPING WITH BASIC COLOURS.

Charge the cold bath with 3—6% acetic acid, allow the liquor to react for a few minutes on the well rinsed cotton previously dyed with Diamine, Immedial or Hydron Colours, and then add the Basic Colour in several portions. When nearly exhausted, the bath is heated gradually, for Diamine Colours up to about 50—60° C. (120—140° F.), and for Immedial or Hydron Colours to the boil.

If only small quantities of Basic Colours are used for topping, the Immedial or Hydron Colours are best topped in a weak, lukewarm soap bath, the use of soft water being however then essential.

DYESTUFFS FOR GREY AND MODE SHADES

a) Simplest method of production.

Para Diamine Black, all brands	} in light shades partly alone or shaded, or for compound shades in combination with
Oxy Diamine Black A, SA, JEI, JB, JW, JWF	
Oxy Diamine Carbon JB, JEI	
Diamine Black BH	Diamine Heliotrope B, O, G
Diamine Catechine B, 3G	Oxy Diamine Violet B
Diamine Brown M, MR, R, S	Diamine Fast Yellow B, FF, A, AR
Diamine Bronze Brown PE	
Oxy Diamine Brown G, 3GN, RN	Diamine Yellow CP
	Oxy Diamine Orange G, R.

For material difficult to dye, such for instance as cops, warps, yarns and cheeses, combinations of the following dyestuffs are especially well adapted for grey and mode shades:

Diamine Fast Blue FFB, FFG, G	Diamine Catechine B, 3G
Diamine Fast Brilliant Blue	Diamine Fast Brown G, R, GB
Diaminogene extra [R	Oxy Diamine Brown 3GN
Diamine Dark Blue B	Diamine Brown M, MR, R, S
Diamine Fast Grey BN	Diamine Fast Scarlet
Diamine Fast Yellow B, FF, A	GFF, 4BFF
Diamine Fast Orange ER, EG	Diamine Rose BD, GD.

Dyeing.

Light shades are mostly dyed without any additions, but in the case of goods which are difficult to penetrate it is an advantage to add some Turkey-red oil or Monosolvol when using soft water.

Medium and deep shades are dyed with the addition of 5—20% Glauber's salt crystals.

It is advisable, in the case of light shades, to commence dyeing lukewarm and heat gradually to the boil; deep shades may be dyed straightaway at the boil.

b) Of very good fastness to light.

Combinations of

*Diamine Fast Blue FFB,	Diamine Black DB, DN
FFG, G	Diamine Dark Blue B
*Diamine Fast Grey BN	*Diamine Fast Yellow B,
Diamine Fast Black C high	FF, A
conc., CB high conc., F,	*Diamine Fast Orange EG, ER
X, XN extra conc.	*Diamine Fast Brown R, G
Diaminogene extra	Diamine Rose BD, GD
Oxy Diaminogene OB,	Diamine Fast Violet
ED, FFN	FFBN, FFRN.

The dyestuffs marked with an asterisk (*) in particular are suited for the production of grey and mode shades.

Dye as stated on the opposite page.

Further, combinations of

Diamineral Blue BF, R, CV	Diamine Fast Grey BN [FF
Diamine Blue RW	Diamine Fast Yellow A, B,
Diamine Sky Blue FF	Diamine Catechine B, 3G
Diamine Fast Black F	Diamine Brown M
Diamineral Black B, 3B, 6B	Diamineral Brown G

aftertreated with sulphate of copper, or with bichrome and sulphate of copper.

Dye as stated on the opposite page. The *aftertreatment* is carried out as follows:

The well rinsed cotton after dyeing is treated at the boil for about $\frac{1}{2}$ hour with

1—3% sulphate of copper and

2—3% acetic acid

or with

1—2% sulphate of copper

1—2% bichrome

2—3% acetic acid,

depending on the depth of shade required, and then rinsed.

c) Fast to washing and milling.

At the same time of good fastness to light:

Combinations of

Diamineral Blue BF, R, CV

Diamineral Black B, 3B, 6B

Diamine Fast Black F

Diamine Fast Grey BN

Diamine Catechine B. 3G

Diamine Fast Yellow B, FF, A

Diamine Brown M

Diamineral Brown G

aftertreated with bichrome and
copper sulphate

OT

Diamine Jet Black Cr, RB

Diamine Dark Blue B

Diamine Fast Black X

shaded with

Diamine Fast Yellow A, FF, B

Diamineral Brown G

aftertreated with bichrome

OF

Diamine Fast Black C high conc., CB high conc., X,

XN extra conc.

aftertreated with formaldehyde and bichrome.

Dye as stated on page 148.

The aftertreatment with bichrome and sulphate of copper is carried out as stated on page 149, the aftertreatment with bichrome is done in the same way, 1—2% bichrome and 2—3% acetic acid being used.

Aftertreatment with formaldehyde and bichrome as stated on page 20.

Resistant also to acid cross-dyeing:

Combinations of

Diamine Black BH

Oxy Diaminogene ED, FFN

Primuline

diazotised and developed with Resorcine, or Resorcine and Beta Naphtol; see page 139.

Dye as stated on page 148.

d) Excellently fast to light, washing and milling,
and resisting acid cross-dyeing*

Any of the Immedial Colours,

the following being especially well suited either for self shades
or in combinations:

Immedial Black	Immedial Cutch G, O, BGG
NNG conc., NLN conc.,	Immedial Yellow Olive
NNR conc., NBB conc.,	G, 5G
NB, NF, NG, NR, NRT	Immedial Olive B, GG, 3G
Immedial Carbon B, R	Immedial Dark Green B
with	Immedial Direct Blue B
Immedial Dark Brown Dconc.	Immedial Green Blue CV
Immedial Brown RR, B,	Immedial Prune S.
W conc.	

The dyestuffs are dissolved in boiling hot condensed water, or
other water free from lime, with the requisite quantity of sodium
sulphide, the solution being then well boiled.

Light, medium, deep shades:

1—3%	3—8%	8—12%	dyestuff
4—6%	6—14%	14—20%	sodium sulphide crystals
3—4 oz	3—4 oz	3—4 oz	soda ash
—	0—1 lb	1—2 lbs	Glauber's salt cryst. } per 10 gallons.

Boil up the dyebath with all the ingredients, and then dye for
 $\frac{1}{2}$ — $\frac{3}{4}$ hour near boiling temperature. Material difficult to penetrate,
which is to be dyed in light shades, is best boiled out previously, adding
1—2% Turkey-red oil or Monosolvol when using soft water; commence
dyeing at 50—60° C. (120—140° F.), raise to the boil, and dye for
another 20 to 30 minutes near boiling temperature.

When dyeing continuously, the quantities of dyestuff and sodium
sulphide for replenishing the bath may be reduced to about $\frac{2}{3}$ — $\frac{3}{4}$
of the weights used for the starting bath, $\frac{1}{4}$ % soda and about 0—5%
Glauber's salt being also added.

Any dyestuff to be added subsequently is dissolved well in
condensed water with the requisite quantity of sodium sulphide and
gradually given into the liquor during the working of the machine,
or, better still, if practicable, after the receptacle containing the
material has been lifted.

An aftertreatment with sulphate of copper and bichrome, or with
nickel sulphate and bichrome, will prevent a subsequent changing of
the shade, the fastness to light of which is also thereby enhanced.
See pages 35 and 143.

* For particulars of dyeing shot effects fast to acids see page 87.

**a) Simplest method of production,
with normal fastness**

Oxy Diamine Brown G,
3GN, RN
Diamine Brown S, R, M, MR
Diamine Catechine B, G, 3G
Diamine Nitrazol Brown
BD, T
Diamine Brown No 30, 33—45.

The following serve for shading
towards yellow:

Diamine Fast Yellow B, A, AR.

For shading towards red:

Oxy Diamine Violet B
Diamine Heliotrope B, G, O
Diamine Purpurine B.

For saddening:

Oxy Diamine Black JEI, JW
Para Diamine Black,
all brands.

Dyed generally at the boil
with the addition of

10—20% Glauber's salt
crystals.

b) Of better fastness to light

Diamine Fast Brown G, R, GB
Diamine Fast Orange EG, ER
saddened and shaded with
Diamine Fast Blue FFB
Diamine Fast Yellow B, A
Diamine Yellow CP

Dyed as stated under "a".

Diamine Brown M
Diamineral Brown G
Diamine Catechine B, 3G
shaded with
Diamineral Black B,
3B, 6B
Diamineral Blue R
Diamine Bengal Blue G
Diamine Fast Yellow
B, A, AR

after-
treated
with
copper
sulphate
and bi-
chrome

The cotton is dyed as directed under
(a), then rinsed, and aftertreated for
20 or 30 minutes at the boil in a fresh
liquor charged with

1½—2% sulphate of copper
1½—2% bichrome
3 —5% acetic acid,

hereafter well rinsed, and dried.

The dyeings treated with bichrome
and sulphate of copper possess also very
good *fastness to washing and milling*.

IN MECHANICAL APPARATUS.

c) Fast to washing and milling

d) Of excellent fastness to washing and milling, good fastness to light, and resisting acid cross-dyeing*

Diamine Nitrazol
Brown GF, BD, RD*,
B, G*, T*
Oxy Diamine Orange
G, R
Oxy Diamine Brown
G, RN
*Diamine Brown S, MR

coupled
with
Nitrazol
C

saddened if necessary with
Diamine Fast Yellow A
Diamine Nitrazol Green
GF, BB, S
Diamine Nitrazol Bordeaux
GB
Diamine Nitrazol Black
B, BB.

Dyed boiling with the addition of 10—20% Glauber's salt.

After dyeing, the cotton is rinsed, and coupled in a fresh cold bath with Nitrazol or with the corresponding quantity of a solution of diazotised Paranitraniline according to directions on page 140.

Diamine Brown M,
MR, S, ATC
Diamine Nitrazol
Brown G, RD
Diamine Fast Brown
G, R

after-
treated
with
formal-
dehyde
and bi-
chrome

Dyed as indicated above, then rinsed, and aftertreated with formaldehyde and bichrome as stated on page 20.

*Primuline
shaded with
*Diamine Black BH
*Oxy Diaminogene ED

diazo-
tised and
developed
with
Resor-
cine as
indicated
on p. 139

The dyestuffs marked with an asterisk (*) are also fast to acid cross-dyeing.

Immedial Cutch O, G, R, BG, BGG
Immedial Brown B, BR, BRS,
RR, W conc.
Immedial Dark Brown A
Immedial Dark Brown D conc.,
DS
Immedial Yellow Brown EN
Immedial Red Brown 3R
Immedial Maroon B conc.

The following serve for shading:

Immedial Yellow Olive G, 5G
Immedial Olive B, GG, 3G
Immedial Bordeaux G conc..
Immedial Prune S [GF conc.
Immedial Black, all brands.

Starting bath:

4—15% dyestuff	}	of the weight of the goods
4—15% sodium sulphide cryst.		
3—4 oz soda ash	}	per 10 gallons liquor
½—1½ lbs Glauber's salt cryst.		

Additions for dyeing subsequent lots:

3 —9 % dyestuff	}	of the weight of the goods
3 —9 % sodium sulphide cryst.		
0.2—0.5% soda ash		
0 —5 % Glauber's salt cryst.		

Dyed boiling hot for ½—¾ hour; after the dyeing, the liquor is pressed off or drawn off by suction, and the goods are rinsed; any aftertreatment with metallic salts that may be necessary is carried out as indicated on page 143.

When dyeing Immedial Red Brown 3R and Immedial Maroon B conc., some acetic acid should be added to the last rinsing bath.

* For particulars of dyeing shot effects fast to acids see page 87.

DYESTUFFS FOR YELLOW AND

a) Simplest method of production,
with normal fastness

Diamine Fast Yellow FF, B,
A, M, AGG
Diamine Yellow CP
Thioflavine S
Oxy Diamine Orange G, R
Diamine Orange G, D, F.

Light shades are dyed either
without any addition or with

1—3% Glauber's salt cryst.,

medium and deep shades with
10—20% Glauber's salt cryst.

For light shades, dyeing is
started lukewarm, raising then to
the boil; deep shades may be dyed
straightaway at the boil.

b) Of very good fastness to light

Diamine Fast Yellow FF, B, A,
Diamine Yellow CP [M, AGG
Diamine Fast Orange EG, ER.

Dyed as described under (a).

Pale cream shades are dyed in water
as soft as possible, with the same
dyestuffs either in a very weak soap
bath or without any addition what-
ever by adding the well dissolved
dyestuff to the cold bath and raising
the temperature gradually to the boil.

Primuline,

aftertreated with chloride of lime.

Dye as stated under (a), treat for
about $\frac{1}{2}$ hour with the clear chloride
of lime solution of $\frac{3}{4}$ ° Tw., rinse, sour
off well, and then rinse again thor-
oughly.

Such a dyeing also resists acid
cross-dyeing very well. and possesses
good fastness to milling.

ORANGE IN MECHANICAL APPARATUS.

c) Of better fastness to washing and milling

d) Exceedingly fast to washing and milling, resisting acid cross-dyeing*

*Primuline, diazotised and developed with Resorcline.

Primuline is dyed at the boil with the addition of 15—20% Glauber's salt crystals, then rinsed cold, diazotised, and developed as indicated on page 139.

Diamine Nitrazol Orange R,
coupled with Nitrazol C.

Dye boiling with 10—20% Glauber's salt, rinse, and couple as described on page 140.

*Thioflavine T, TCN

Tannin Orange R

Paraphosphine GG, G, R

Diamond Phosphine

GG, R, PG, D

shaded with

*Irisamine G

on a
tannin-
anti-
mony
mordant.

Mordant in a hot bath with 2—4% tannic acid according to the depth of shade required, press off, or whizz well, then fix in a cold bath with 1½—2½% tartar emetic, and finally rinse well.

Condensed water should be used as far as possible for the dyeing. The bath is first charged with 3—5% acetic acid, the dyestuff solution being then added gradually in several portions. When nearly exhausted, the bath is heated gradually to boiling point. The goods are finally rinsed well. For further details see page 146.

The dyestuffs marked with an asterisk (*) are also resistant to acid cross-dyeing. The Basic Colours must for this purpose be mordanted once more after the dyeing. (Page 50.)

Immedial Yellow D, GG
Immedial Orange C.

Starting bath:

4—12% dyestuff	} of the weight of the goods
6—15% sodium sulphide crystals	
3—4 oz soda ash	} per 10 gallons liquor
½—1½ lbs Glauber's salt crystals	

For dyeing subsequent lots:

3—9% dyestuff	} of the weight of the goods
4—12% sodium sulphide crystals	
0.1—0.2% soda ash	

Dye boiling hot for ½ to ¾ hour; then remove the liquor well by suction or pressure, and rinse thoroughly. Immedial Yellow GG is however dyed without any soda or salt, and in the case of Immedial Yellow GG and D some acetic acid is added advantageously to the last rinsing bath.

By an aftertreatment with bichrome and copper sulphate or nickel sulphate the fastness to light of the dyeings produced with Immedial Yellow D and Immedial Orange C is increased considerably.

For particulars of aftertreatment see page 143.

* For particulars of dyeing shot effects fast to acids see page 87.

DYESTUFFS FOR PINK, RED, CLARET

a) Simplest method of production

For Pink and Red:

- *Diamine Rose, all brands
- *Direct Rose T
- Diamine Red 4B, 5B, 6B, 10B
- Diamine Purpurine B, 3B, 6B, V
- *Diamine Brilliant Scarlet S
- *Diamine Fast Scarlet,
- all brands.

For Claret and Violet:

- Diamine Bordeaux B, BR
- Diamine Brilliant Bordeaux R
- *Diamine Brilliant Rubine S
- Diamine Heliotrope B, G, O
- Diamine Violet N, BB
- Diamine Brilliant Violet B, RR
- Oxy Diamine Violet B, G, R, BF

Light shades are dyed lukewarm to boiling with the addition of 2—3% Glauber's salt crystals or phosphate of soda, medium and deep shades boiling with 10—20% Glauber's salt crystals; for Diamine Red and Diamine Fast Scarlet it is well to add subsequently 3—5% phosphate of soda, instead of Glauber's salt.

Very light pinks on cops, yarns, cheeses and warps are best dyed without any additions at all, or in soft water with the addition of some Monosolvol, Turkey-red oil or soap. The dyeing is started lukewarm, the temperature being raised gradually to the boil.

The dyestuffs marked with an asterisk (*) resist the action of dilute mineral acids.

b) Of better fastness to light

- Diamine Rose, all brands
- Diamine Fast Bordeaux 6BS
- Diamine Bordeaux B, BR
- Diamine Brilliant Bordeaux R
- Diamine Fast Violet FFBN,
- FFRN

shaded with

- Diamine Fast Brilliant Blue
- Diamine Fast Blue FFB [R
- Diamine Fast Brown R, G
- Diamine Fast Yellow A, B.

- Diamine Fast Scarlet
- GG, GFF, 4BFF,
- 4BFS, 5BFF, 7BFF
- Diamine Brilliant
- Rubine S
- Diamine Fast Violet
- FFBN

after-
treated
with
copper
sulphate

Dyed as described under (a).

Re aftertreatment with sulphate of copper see page 139.

Safranine, all brands

Tannin Heliotrope

dyed on a tannin-antimony mordant as per directions on page 146.

AND VIOLET IN MECHANICAL APPARATUS.

c) Of better fastness to washing and milling

*Primuline
 *Diamine Azo Scarlet
 A, B, 4B, 8B
 *Diamine Azo
 Bordeaux B
 shaded with
 *Diamine Black BH
 *Diaminogene Blue
 3RN, 6RN
 *Diamine Azo Blue RR

diazotised and developed
with Beta Naphtol.

*Primuline, diazotised and developed with Bordeaux Developer.

Diamine Nitrazol
 Scarlet A
 Diamine Nitrazol
 Bordeaux GB

coupled
with
Nitrazol C

Dyed as stated under (a) and developed or coupled as per directions on pages 139 and 140.

Irisamine G
 Rosazeïne 6G
 Safranine, all brands
 Tannin Heliotrope
 Methyl Violet,
 all brands
 Crystal Violet
 5B bluish, 10B
 shaded with
 New Methylene Blue
 3R
 Diamond Phosphine
 Thioflavine T, TCN

dyed on a tannin and antimony
mordant as per directions on
page 146.

d) Of good fastness to washing and milling

Immedial Bordeaux G conc.,
 GF conc.
 Immedial Maroon B conc.
 *Immedial Red Brown 3R
 Immedial Violet C, CB, CR
 *Immedial Indone Violet B conc.
 Immedial Purple C
 *Immedial Prune S.

Of good fastness to light at the same
 time:

Immedial Bordeaux G conc.,
 GF conc.
 Immedial Maroon B conc.
 Immedial Indone Violet B conc.
 Immedial Prune S.

Starting bath:

4—16 % dyestuff	}	of the weights of the goods
6—16 % sodium sulphide crystals		
3—4 oz soda ash	}	per 10 gallons liquor
0—1½ lbs Glauber's salt crystals		

For subsequent lots:

2.5—8 % dyestuff	}	of the weights of the goods
2.5—8 % sodium sulphide crystals		
0.1—0.2 % soda ash	}	
0 —3 % Glauber's salt crystals		

Dye for ½ to ¾ hour at 60—70° C. (140—160° F.), remove the liquor rapidly by suction or pressure, rinse, and add some acetic acid to the last rinsing bath.

The dyestuffs marked with an asterisk (*) likewise resist acid cross-dyeing well.

**a) Simplest method of production,
with normal fastness**

Diamine Sky Blue, FF, FFN, FFS
 Diamine Pure Blue A
 Diamine Blue 3B, 2B, RW, BX,
 3R, NC, No. 50, 52, 52a, 53,
 53a, 55, 56
 Diamine Brilliant Blue G
 Oxy Diamine Blue
 5G, 3G, G, R, 3R
 Diamine Azo Blue
 R, RR, 6B, No 51, 54
 Diamineral Blue R, B, BF, 3B,
 CV, CVB, 3RC
 Diamine Bengal Blue R, G
 Diamine Black BH, BHN.

The following serve for saddening:

Oxy Diamine Black A, SA, JW
 Para Diamine Black, all brands.

For shading reddish or purplish
 blues:

Diamine Heliotrope G, B, O
 Diamine Brilliant Violet B, RR.

Light shades are dyed lukewarm to
 boiling hot for $\frac{1}{2}$ — $\frac{3}{4}$ hour with
 3—5% phosphate of soda or
 2—3% Glauber's salt cryst.,

medium and deep shades boiling hot
 for $\frac{3}{4}$ —1 hour with
 10—20% Glauber's salt cryst.

Very light shades on yarn, cops,
 cheeses and warps are best dyed without
 any addition of salt, or in soft water
 with

1—2% Turkey-red oil or Monosolvol,
 commencing lukewarm and raising
 gradually to the boil.

b) Of very good fastness to light

Diamine Fast Blue FFB,
 FFG, G, BN
 Diamine Fast Brilliant Blue R
 dyed as stated under (a).

Diamine Sky Blue FF, FFN, FFS	} after- treated with copper sulphate or bi- chrome and copper sulphate
Diamine Blue RW	
Diamine Blue 3R	
Diamineral Blue R, B, BF, 3B, CV, CVB	
Diamine Dark Blue B	
Diamine Bengal Blue G, R	

These products are dyed as de-
 scribed under (a); the cotton is
 then rinsed and aftertreated for
 20 or 30 minutes at the boil in a
 fresh liquor containing

1—3% copper sulphate (according
 to the depth of the shade)
 and
 3% acetic acid.

The cotton is then rinsed again,
 and dried.

c) Of very good fastness to washing and milling

Diaminogene Dark Blue	} diazotised and developed with Beta Naphtol
Diamine Azo Blue R, RR, 6B	
*Diamine Black BH, BHN	

Of very good fastness to light:

*Diaminogene Sky Blue N	} diazotised and developed with Beta Naphtol
Diaminogene Blue G, BB	
*Diaminogene Blue NB, NA,	
2RN, 3RN, 6RN	

These products are dyed with

5—15% Glauber's salt cryst., according to the depth of shade.

After $\frac{3}{4}$ hour's dyeing in the boiling bath, rinse cold, then diazotise, and develop with Beta Naphtol, as described on page 139.

Naphtindone BB, BR	} on a tannin-antimony mordant
*New Methylene Blue N, GG, R	
Indazine M	

For dyeing directions see page 146.

Naphtindone BB may also be dyed as follows:

Mordant the goods in the machine with 15—20% extract of sumac for $\frac{3}{4}$ hour in a warm bath, rinse lightly, and aftertreat with 2—3% antimony salts; rinse again thoroughly, and dye.

Add first to the dyebath

3% sulphate of alumina and
3% acetic acid,

enter the cotton, heat the bath to 50° C. (120° F.), and allow the liquor to act for $\frac{1}{4}$ hour.

Meanwhile dissolve the requisite dyestuff (2—3% Naphtindone BB) in hot condensed water, with the addition of half its weight of acetic acid, and add the solution gradually to the dyebath in the course of about $\frac{1}{2}$ hour. Bring the bath slowly to the boil, and boil well for $\frac{1}{2}$ hour until it is exhausted perfectly; then rinse thoroughly.

The products marked with an asterisk (*) withstand acid cross-dyeing. The Basic Colours must for this purpose after dyeing be mordanted again (see page 50).

d) Exceedingly fast to light, washing and milling,

Immedial Indone R, RG, RR,
4B, 3B, B, BF, BBF, JBF,
BN, JBN, RB conc.
Immedial Dark Blue J.

Starting bath:

2—16% dyestuff	} of the weight of the goods
6—32% sodium sulphide crystals	
4—8 oz soda ash	} per 10 gallons water
0—1 lb Glauber's salt crystals	

For dyeing subsequent lots:

1.5—8 % dyestuff	} of the weight of the goods
3 —16 % sodium sulphide crystals	
0.2—0.5% soda ash	

Dye the previously wetted material for $\frac{1}{2}$ to 1 hour, for very bright shades best at 40—50° C. (105—120° F.), and more covered shades at a slightly higher temperature, 70—80° C. (160—175° F.).

Dyeing being completed, run off the liquor, and free the material as rapidly as possible from the adhering liquor by suction, pressing off or whizzing, and finally rinse.

The oxidation may be assisted by a treatment with Immedial Developer or with bichrome and bisulphite. For full particulars see pages 142 and 143.

Immedial Direct Blue B, BB, JB,
4B, JND, RC, FCL extra conc.
Immedial Indogene GCL, BCL,
RCL, RRCL, B conc.

Starting bath:

4—16% dyestuff	} of the weight of the goods
8—32% sodium sulphide crystals	
4—8 oz soda ash	} per 10 gallons liquor
0—1½ lbs Glauber's salt crystals	

For dyeing subsequent lots:

2.5—8 % dyestuff	} of the weight of the goods
5 —16 % sodium sulphide crystals	
0.2—0.5% soda ash	
0 —3 % Glauber's salt crystals	

Immedial Direct Blue B, JB, R,
Immedial Green Blue CV [OD
Immedial Dark Blue CRV.

For these products the dyebaths are prepared as stated above, but generally the same quantity of sodium sulphide crystals as of dyestuff is sufficient.

Dye for $\frac{1}{2}$ —1 hour near boiling temperature; for very bright shades, Immedial Indogene may be dyed at 50—60° C. (120—140° F.).

Dyeing being completed, run off the liquor, and free the material as rapidly as possible from the adhering liquor by suction, pressing off or whizzing, and rinse.

The brightness of the Immedial Direct Blues may be considerably improved by the treatment with Immedial Developer or metallic salts, according to the directions given on pages 142 and 143.

and resisting acid cross-dyeing

Particularly fast to light, washing,
milling, chloring and bleaching

Immedial Blue C extra conc.,
CB extra conc., CR extra conc.
Immedial New Blue G conc.

Hydron Blue G and R powder
Hydron Blue G and R
paste 20%.

Starting bath:

4—16 % dyestuff	}	of the weight of the goods
8—32 % sodium sulphide crystals		
1½—3 oz caustic sody lye	}	per 10 gallons liquor
77° Tw.		
0 —1½ lbs Glauber's salt	}	
crystals		

For full particulars see page 144.

Regarding the bleaching of
piece-goods containing yarn dyed
with Hydron Blue see page 46.

For subsequent lots:

2.5— 8% dyestuff	}	of the weight of the goods
5 —12% sodium sulphide crystals		
1/8—1/4 % caustic soda lye	}	
77° Tw.		
0 — 3% Glauber's salt	}	
crystals		

The dyeings also well resist
acid cross-dyeing.

Immedial Blue C, CB, CR.

For these brands charge the baths
as stated above, but the same weight
of sodium sulphide crystals as of
dyestuff will generally prove sufficient.

Dye for ½ to 1 hour near boiling
temperature, then treat by one of the
under-mentioned methods:

I. Remove the liquor very thoroughly
from the goods by suction, pressure or
whizzing, develop the Blue by smother-
ing or steaming, and then rinse.

II. After dyeing, remove the liquor
as thoroughly as possible, rinse, and
then straightaway subject the goods
to the subsequent manipulations, or
develop the Blue by means of Immedial
Developer or metallic salts.

For full particulars regarding the
various methods of developing see pages
142—144.

DYESTUFFS FOR GREEN

a) Simplest method of production,
with normal fastness

b) Of very good fastness to light

Diamine Green B, G, CL, FG,
NA, BO, BZ

Diamine Dark Green N

shaded with

Thioflavine S

Diamine Fast Yellow FF, B, A,

Diamine Orange G, D [AGG

Oxy Diamine Orange G, R.

The following serve for saddening:

Diamine Black HW, BH

Oxy Diamine Black JE.

For brighter shades of Green:

Diamine Sky Blue FF, FFN, FFS

shaded with

Thioflavine S.

Dye *light shades* lukewarm to
boiling hot for $\frac{1}{2}$ to $\frac{3}{4}$ hour with

2—3% phosphate of soda or

2—3% Glauber's salt crystals,

medium and dark shades boiling hot
for $\frac{3}{4}$ —1 hour with

10—20% Glauber's salt crystals.

Very light shades on cops, yarns
and cheeses are best dyed without
any addition of salt and in soft water
with some Turkey-red oil or Monosol-
vol. commencing lukewarm and raising
gradually to the boil.

Diamine Fast Blue FFG,

FFB, G, BN

in combination with

Diamine Fast Yellow FF, B,

A, AGG

Diamine Fast Orange EG, ER.

Diamine Sky Blue

FF, FFN, FFS

Diamine Blue RW

Diamineral Blue

R, BF

in combination with

Diamine Fast Yellow

FF, B, A, AGG

after-
treated
with
copper
sulphate

Dyed in the manner described
under (a). After rinsing well, the
aftertreating is carried out for
20—30 minutes at the boil in a
fresh liquor charged with

1—3% copper sulphate (according
to the depth of the shade)
and

3% acetic acid.

The goods are treated for 20 to
30 minutes at the boil, then rinsed
well, and dried.

AND OLIVE IN MECHANICAL APPARATUS.

c) Fast to washing and milling

Diamine Nitrazol
Green GF, BB, S
shaded with
Diamine Fast Yellow

A

coupled
with
Nitrazol
C

Dyed as described under (a),
and coupled in accordance with the
directions on page 140.

Diamine Green G
shaded with
Diamine Fast Yellow
FF, A
Diamineral Brown G
Diamineral Blue R

after-
treated
with
chrome
salts

The cotton is dyed as describe
under (a), then rinsed, and treated
in a fresh liquor with chrome salts
as stated on page 139.

*Brilliant Green
*Solid Green
*New Methylene Blue
GG
shaded with
*Thioflavine T
Paraphosphine
GG, G, R
Diamond Phosphine
GG, R

on a
tannin-
anti-
mony
mordant

Dyed in the manner described
on page 155, section (c).

The dyestuff marked with an
asterisk (*) withstand also acid
cross-dyeing if mordanted subse-
quently as described on page 50.

d) Of excellent fastness to washing,
-milling and light, and resisting
acid cross-dyeing*

Immedial Brilliant Green G extra
Immedial Green GG extra,
BB extra, GGX conc., BBX
conc., BBXN conc.

Immedial Deep Green G
Immedial Dark Green B
Immedial Olive B, GG, 3G
Immedial Yellow Olive G, 5G

shaded with

Immedial Green Blue CV
Immedial Indogene GCL conc.
Immedial Yellow D, GG
Immedial Yellow Brown EN
Immedial Black NNG conc.

Starting bath:

4—14% dyestuff	}	of the weight of the goods
4—14% sodium sulphide crystals		
3—4 oz soda ash	}	per 10 gallons liquor
4 oz—2 lbs Glauber' salt crystals		

For dyeing subsequent lots:

2.5—9 % dyestuff	}	of the weight of the goods
2.5—9 % sodium sulphide crystals		
0.1—0.2% soda ash 0 —5 % Glauber's salt crystals		

Dye near boiling temperature. After
dyeing, the liquor is thoroughly removed
by suction or pressure, the goods being
then rinsed.

For combinations of Immedial Green
with Immedial Yellow, some acetic acid
is added to the last rinsing bath.

* For particulars of dyeing effects
fast to acids see page 51.

**a) Simplest method of production,
with normal fastness**

Blue-blacks:

Oxy Diamine Black A, SA,
FFC, JW, JWF, JWB extra
conc., JWN extra conc.,
JWF superior
Para Diamine Black,
all brands.

Greenish Blacks:

Oxy Diamine Black
JE, JEL, JB, D, AT.
Oxy Diamine Carbon JEL, JB.

For well covered, deep Blacks:

Oxy Diamine Black RR, AM,
FFN extra conc., FM extra
conc.

All the above products are dyed
boiling with

15—20% Glauber's salt cryst.
and, if necessary,
 $\frac{1}{2}$ —2% soda ash
and when dyeing in the standing
bath, with
4—5% Glauber's salt cryst.
and
0,1—0,2% soda ash.

The amount of salt contained
in the liquor should be ascertained
from time to time by testing the
cold liquor with the hydrometer.
If the specific gravity exceeds
8—12° deg. Tw., further additions of
salt may be suspended for a while.

b) Of better fastness to light

Diamine Jet Black RB, Cr
Diamine Fast Black F, X,
XN extra conc., C high conc.,
CB high conc.

Dyed as stated under (a).

Possessing at the same time good
fastness to washing and milling:

Diamineral Black B, 3B, 6B
Diamine Fast Black F,
aftertreated with bichrome and
copper sulphate.

Diamine Jet Black Cr, RB
aftertreated with bichrome.

Dye as stated under (a). then rinse,
and aftertreat for 20 to 30 minutes at
70—80° C. (160—175° F.) with

2% bichrome
2% copper sulphate
3% acetic acid
or
3% bichrome and
3% acetic acid.

Finally rinse well, and dry.

Diamine Fast Black F, X,
XN extra conc., C high conc.,
CB high conc., aftertreated with
formaldehyde and bichrome
dyed as stated under (a), and after-
treated as indicated on page 20.

c) Of very good fastness to washing, and resisting acid cross-dyeing

Cheapest method of production.

Diamine Nitrazol Black B, BB	} coupled with Nitrazol C
Oxy Diamine Black A, D, JW, JEI, JWF	
Oxy Diamine Carbon JEI, JB	

Dyed as stated under (a), and then coupled as indicated on page 140.

Diamine Black BH, developed with Phenylene Diamine, or
Phenylene Diamine and Beta Naphtol.

Dyed as stated sub (a), rinsed cold, then diazotised, and developed as per details on page 139.

Further:

Oxy Diamine Black UI, US, SA, JWF, JW, JB, JEI, JWB extra conc., JWN extra conc.	} aftertreated with formaldehyde and bichrome
Oxy Diamine Carbon JEI, JB	
Para Diamine Black, all brands	

After rinsing, treat for about 20 to 30 minutes at 50—60° C. (120—140° F.) with

3% formaldehyde
1—2% bichrome
3% acetic acid.

Of very good fastness to light.

Diaminogene extra, B, BR, BW, CCL	} developed with Phenylene Diamine, Phenylene Diamine and Resorcline, or, Phenylene Diamine and Beta Naphtol
Oxy Diaminogene OB, OT, ED, EF, FFN	
Diamine Black DB, DN	

The dyeing is carried out as stated under (a), the diazotising and developing as described on page 139.

DYESTUFFS FOR PRODUCING BLACK

d) Excellently fast to light, washing and milling,

Immedial Black V extra, FF extra, G extra
Immedial Brilliant Black B
Immedial Black NB, NF, NG.

Starting bath:

2	—3	lbs dyestuff	} per 10 gallons liquor
13/4	—2 1/4	lbs sodium sulphide crystals	
4	—8	oz soda ash	
3	—4	lbs Glauber's salt crystals	

For dyeing subsequent lots:

10—14	% dyestuff	} of the weight of the goods
7.5—10	% sodium sulphide crystals	
0.2—0.5	% soda ash	
0—5	% Glauber's salt crystals	

Dyed as stated on the opposite page (page 167).

Immedial Black NN conc., NNR conc., NNG conc.,
NBB conc., BF conc., NLN conc., NNZ conc.
Immedial Brilliant Black 5BV conc., 6BG conc., 8BG conc.

Starting bath:

1 3/8	—1 3/4	lbs dyestuff	} per 10 gallons liquor
1 3/8	—1 3/4	lbs sodium sul- phide cryst.	
4	—8	oz soda ash	
3	—4	lbs Glauber's salt crystals	

For dyeing subsequent lots:

8—10	% dyestuff	} of the weight of the goods
8—10	% sodium sulphide crystals	
0.2—0.5	% soda ash	
0—5	% Glauber's salt crystals	

Dyed as stated on the opposite page (page 167).

Immedial Carbon B, R, JHJ, BL, KBL, KBG
Immedial Brilliant Carbon F, FB, FG.

Starting bath:

14—20	oz dyestuff	} per 10 gallons liquor	
1 3/4	—2 1/2		lbs sodium sulphide crystals
4	—8		oz soda ash
3	—4		lbs Glauber's salt crystals

For dyeing subsequent lots:

5—8	% dyestuff	} of the weight of the goods
10—16	% sodium sulphide crystals	
0.2—0.5	% soda ash	
0—5	% Glauber's salt crystals	

Dyed as stated on the opposite page (page 167).

and resisting acid cross-dyeing

Indo Carbon S, SF.

Starting bath:

18 oz—1½ lbs dyestuff	} per 10 gallons liquor
2¼ —3 lbs sodium sulphide cryst.	
4 —8 oz soda ash	
3 —4 lbs Glauber's salt crystals	

For dyeing subsequent lots:

7—8 % dyestuff	} of the weight of the goods
14—16 % sodium sulphide crystals	
0.2—0.5 % soda ash	
0—5 % Glauber's salt crystals	

The goods are dyed either for about ¾ hour near the boil, or by boiling first for about ¼ hour and working for another ½ hour without further heating.

The dyeing being completed, the liquor is removed either by suction, pressure or whizzing, the goods being finally rinsed well.

Both the liquor and the first rinsing water may be used again for subsequent lots, the latter serving for replenishing the liquor.

It is well to test the liquor from time to time with a hydrometer in order to determine the quantity of salt contained in the bath. If the liquor when cold shows a specific gravity exceeding 9° Tw., a further addition of salt is omitted. In some special cases however when the material is easily penetrated, the specific gravity may be allowed to reach 16° Tw., especially in the case of Immedial Black NN conc., BF conc. and NLN conc. and of the various brands of Immedial Carbon.

In the case both of direct and aftertreated dyeings. 5—8 oz acetate or formate of soda per 10 gallons liquor is added to the last rinsing bath, this liquor being allowed to act for a short time, the goods being then dried without again rinsing.

Soda may also be used in many cases in the place of acetate or formate of soda. (For particulars also regarding the aftertreatment with acetate or formate of soda see page 144.)

For dyeings of Indo Carbon the aftertreatment with acetate of soda is not necessary.

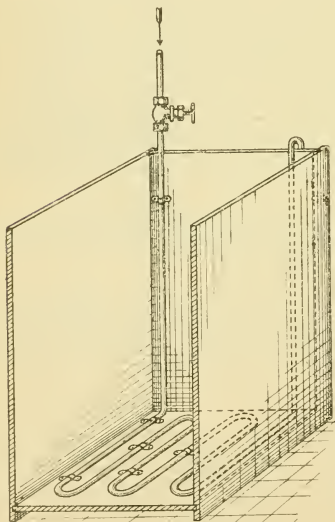
II. FROTH-DYEING.

The apparatus for froth-dyeing is quite the simplest form of dyeing apparatus and is resorted to chiefly in such cases where the requirements for levelness of shade are not very exacting; it is applied principally for the dyeing of cheeses.

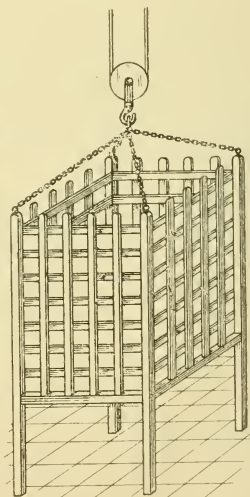
The material is dyed in the froth produced by intense boiling.

The apparatus used for this purpose consists for instance of a square wooden box, about $5\frac{1}{2}$ to 6 feet high and 3 to $3\frac{1}{2}$ feet wide, fitted with a strong steam pipe about 2" in diameter and of a total length of 25 to 36 feet. This steam pipe passes down one side of the box, being coiled on the bottom.

The construction of the apparatus is illustrated by the following sketch: one side of the dye-vessel is left open in order to show the interior of the box.



Dye-box.



Cage.

The apparatus consists of an outer box containing the liquor, and a cage for holding the cheeses, which is lowered into the dye box by means of a crane. The cage is provided with short wooden legs to prevent the bottom layer of the cheeses from coming into contact with the boiling liquor.

The froth should always be very even and fine, and cover the material completely. If this is not the case, the steam is not properly regulated, or the liquor is too dilute.

With fairly good pressure, very little steam is required for maintaining the froth, and it is often sufficient to give the steam valve a half or three-quarter turn only.

It is best to work with closed steam coils, and to replenish the evaporating liquor from time to time by the addition of water.

In order to maintain the same volume of liquor, without replenishing it, the condense water accumulating in the steam-coil may be returned to the bath.

During the dyeing operation the discharge valve is then opened just enough to allow the condensed water which has formed to flow out into a vertical pipe so as to drain back into the liquor in the space between the liquor box and the cage.

For a lot of 250—300 lbs, the volume of the liquor used should be about 80 to 90 gallons, the capacity of the apparatus being 50 cubic feet.

In order to ensure good results, it is essential to use soft water and pure materials; to this end only good soda ash, Glauber's salt crystals and a clear solution of a good quality of sodium sulphide crystals should be used. See page 133.

Dyeing. Diamine or Immedial Colours may be used for froth-dyeing. The material to be dyed need not be wetted previously.

Diamine Colours. These are dyed in light shades best with the addition of some Turkey-red oil, Monosolvol, or soap, in deep shades without any addition, or with some salt. Generally the dyestuffs adapted for machine dyeing, and enumerated in the foregoing tables, should be used.

When dyeing yarns which are difficult to penetrate, or when producing light shades, it is an advantage to

repack the material during the dyeing operation. Light shades after dyeing are as a rule whizzed straightaway without rinsing, and dried. The duration of the dyeing process is from 1 to 2 hours.

Immedial Colours for froth dyeing, should be dyed in the first place with a little more sodium sulphide than is used for machine dyeing generally. Light shades are dyed without salt and with the addition of some Turkey-red oil or Monosolvol; in the case of deep shades or of Blacks, which are the most used in froth dyeing, some salt may also be added.

Black is dyed approximately as follows:

	I.	II.	III. Bath:
Immedial Carbon B	10—12%	6— 7%	6— 7%
Sodium sulphide crystals	25—30%	12—18%	12—18%
Soda ash	2%	$\frac{1}{2}$ %	$\frac{1}{2}$ %
Glauber's salt crystals	20%	5%	3%

The dyestuff is dissolved in the customary manner with the sodium sulphide and the soda, the solution being added to the dyebath; the latter is then boiled up and salt added, the dry material then being entered.

The dyeing lasts for $1\frac{1}{2}$ to 2 hours.

Dyeing being finished, the cage containing the material is lifted right out, and the cotton rinsed at once by means of a shower arrangement fixed just above the machine, the first rinsing water being allowed to flow back into the dyebath for replenishing the dye liquor.

In some cases the cops or cheeses are whizzed after being rinsed and then entered for about $\frac{1}{2}$ hour into lukewarm water which may be renewed repeatedly. They are thereupon rinsed again well, and brightened. Finally a further aftertreatment with acetate of soda is given either in a vat containing 5—8 oz acetate of soda per 10 gallons liquor, or by pouring a similar solution of acetate of soda over the cotton during the whizzing.

Cheeses dyed with Immedial Black are frequently brightened, the Black by such process gaining in body and beauty of shade.

After whizzing, the bobbins are thrown into a vessel containing lukewarm water charged with 1—2% fat (or oil) and some soda solution, sometimes also 1—2% starch, worked therein for some time, and then whizzed again.

DRYING LOOSE COTTON, SLUBBING AND SLIVER.

The material, in order to spin well, must be dyed in good, soft water, and then rinsed thoroughly, likewise with soft water if possible.

The drying is however also of especial importance, and should be carried out neither too hot nor too quickly; it is best to dry at a moderate temperature and with a thorough circulation of air. After drying, the material, especially slubbing, is to advantage stored for some time in order to absorb moisture. It is often an advantage also to add some common salt to the last rinsing bath so that after drying the material may better absorb the humidity necessary for spinning.

DRYING COPS AND CHEESES.

Suitable drying is of considerable importance for the evenness and good exterior of the dyed cops and cheeses.

After dyeing and rinsing, the adhering liquor is removed as thoroughly as possible, by whizzing, suction, or pressure, the goods being then dried without delay with a copious supply of air; they may to good advantage be dried on a lattice frame studded with tinned nails.

The cops and cheeses dyed in spindle machines are frequently dried straightaway in the machines by thoroughly removing the adhering liquor and circulating hot air by means of the vacuum pump, whereby a quick and even drying of the goods is effected.

With some of the shades produced with Diamine Colours it may happen that, during the drying, the shade of cops and cheeses will become uneven in as far as they may for instance become deeper on the surface, although they were dyed completely level. This will mostly happen if the goods have not been sufficiently rinsed after dyeing, and still contain too much water when being dried; this drawback can however be overcome by rinsing and whizzing thoroughly. If the final rinsing is carried out in very soft water, it will also prove of advantage to add some acetic acid or salt (Glauber's salt, common salt or Epsom salts).

THE SIZING OF CHEESES.

The dressing and stiffening of cheeses may also be carried out in apparatus; this method of working is generally resorted to if the yarns are not required to be particularly stiff, and then offers great advantages.

The sizing is done in the same kind of apparatus as the dyeing, but for preference a special apparatus is used. The dyed cheeses are rinsed well the last rinsing bath being heated lightly, and 1—2% acetic acid, or 2—3% sumac extract for Blacks, being to advantage added, that the size be taken up quickly by the cheeses. This liquor is circulated for a few minutes, the goods being hydro-extracted very thoroughly before the sizing.

The best sizing is prepared starch, to which some glycerine, fat, Monosolvul or soap may be added for softening.

Prepared starch is marketed under various denominations, such as apparatine, etc., but may also be prepared without difficulty by mixing potato starch with caustic soda lye or with chloride of lime. Prepared starch mixed with chloride of lime in particular is well adapted for sizing in apparatus.

For sizing 100 lbs of cheeses, the size is for instance prepared as follows:

125 lbs	potato starch are mixed with
75 gallons	cold water; then
7 „	chloride of lime solution 15° Tw. are added.
	The whole is heated to the boil, and
	after boiling for 15 minutes,
1½ oz	perborate of soda are added; the mixture
	is boiled again for 20 minutes,
1—1½ pint	of glycerine being added finally if necessary.

When sizing Immedial Black dyeings, with the exception of such produced with Indo Carbon, the requisite quantity of acetate of soda is added to the size.

The sizing proper takes about ½ hour at 60—70° C. (140—160° F.). The cheeses are then freed from the adhering liquor by suction, pressure, or whizzing, and dried severely. A rapid and severe drying is essential to good results.

The size may be used over again for sizing further lots, after having been adequately brought up to strength.

DYEING OF YARN WITH A HARD HANDLE (POLISHED YARN) IN DYEING MACHINES.

Black polished yarns were formerly dyed with logwood exclusively. Nowadays, however, direct dyeing Blacks (Para Diamine Black and Oxy Diamine Black) are used in ever increasing quantities in preference to logwood, and in certain cases also Immedial Black or Immedial Carbon, their application, in dyeing machines especially, being simpler; the Diamine Blacks besides have the advantage of better fastness to acids and the Immedial Blacks the additional advantage of excellent fastness to light.

Para Diamine Black B extra conc., BB extra conc., FFB extra conc., FFD extra conc., 580J, are the products used principally, sometimes also in combination with Oxy Diamine Black JEI extra conc. or JWF extra conc. Of the Immedial Blacks, Immedial Carbon B or R are the brands principally used. About $4\frac{1}{2}$ —6% Para Diamine Black extra conc., or 6—7% Immedial Carbon are the ordinary quantities in a standing bath.

The following is an approved method, obtained from practice, of working with Para Diamine Black, effecting at the same time a considerable increase in the weight of the yarn.

For 100 lbs Cotton Yarn in about 90 gallons liquor.

The machine is charged with the dry yarns, which are boiled for 1 to $1\frac{1}{2}$ hours with plain water, and then rinsed once. The dyebath is approximately prepared as follows:

	1. bath:	2. and subsequent lots:
Para Diamine Black FFB extra conc.	7 lbs	4 lbs
Logwood extract	3 "	2 "
Quebracho extract	$4\frac{1}{4}$ "	$3\frac{1}{2}$ "
Common salt	15 "	3 "

Dye boiling hot for about 1 hour, rinse cold twice over, and treat with

3 pints pyrolignite of iron and
3 " acetic acid

at 30—40° C. (85—105° F.), then whizz without rinsing.

The yarn is then subjected to the finishing operation, best by hand in lots of one pound each. The sizing liquor is prepared as follows:

14—16 lbs potato starch are mixed with a little
 cold water, and boiled up with
20 gallons water; when cold,
3 pints Monosolvol is added, the whole being
 stirred well.

According to the kind of yarn to be treated, this liquor is diluted with one-third or the same weight of water, and finally

1 lb logwood extract and
 $\frac{3}{8}$ lb nitrate of iron
are added.

In order to weight the goods more effectively, some Epsom salts may be added to the size. If the yarns are required to possess a harder handle, the quantity of potato starch must be increased correspondingly.

After the finishing operation, the yarns are wound off loosely, and brushed on the polishing machine until dry, paraffine being spread on to the yarn during this operation.

WARP DYEING.
DYEING OF WARPS IN THE SIZE.

WARP-DYEING.

Warp yarns are dyed either in form of hanks or cheeses, and also in large quantities in form of warps.

The dyeing in form of warps is usually carried out

I. In a continuous passage

- a) in special roller-boxes
- b) in the size;

II. Beamed on perforated warp beams in dyeing machines, similarly to the dyeing of cops and cheeses according to the spindle system;

III. In packing apparatus, the warps being packed firmly into the receptacles like cotton yarn, etc.

Beamed warps (on the warp-beam) and warps packed in packing apparatus are dyed in exactly the same manner as hanks, cops and cheeses in mechanical apparatus, the same dyestuffs also being used; for particulars see the chapter on machine-dyeing on page 129 et seq.

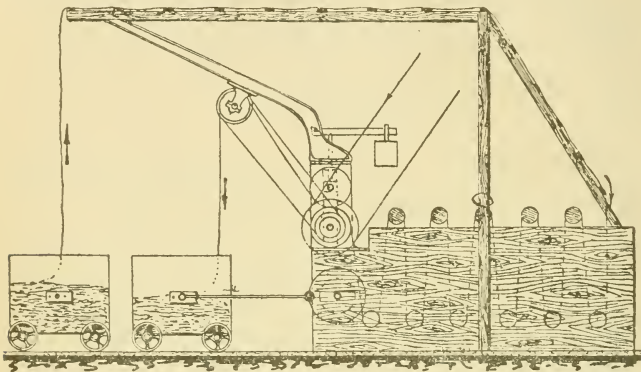
DYEING OF WARPS IN ROLLER-BOXES.

For warp dyeing, Diamine, Immedial and Hydron Colours as a rule are used, the dyestuffs and methods of dyeing being the same as for hank dyeing. The particulars in the tables on pages 100—119 and in our pattern cards for cotton yarn will thus as a rule serve as a useful guide for the suitable selection of dyestuffs. All that has to be observed is that the duration of the dyeing is shorter and that the first bath has to be charged with much more dyestuff proportionately.

DYEING WITH DIAMINE COLOURS.

The method of working and the concentration of the baths vary with the existing arrangements; as a rule the warps are dyed by one or more passages through the roller-box charged with the dye-liquor.

Warps are generally dyed in a box provided with rollers similar to the following sketch, which may be considered as typical of its kind. For a very large output of staple shades, large continuous machines are used similar in construction to that described on page 182 and usually employed for the dyeing of Immedial Colours.



PREPARATION.

The warps are to advantage boiled before dyeing, especially so for light shades, being either immersed in a kier, same as for cotton yarn, or passed through a machine like that used for dyeing, charged with a boiling liquor of soda or Turkey-red oil or Monosolvol.

DYEING.

Light shades are mostly dyed in a warm to hot bath with not more than one or two passages, adding first, according to the speed of the machine, $\frac{1}{4}$ — $\frac{1}{5}$ of the requisite dyestuff well dissolved, and the salt, and the remainder during the passage of the goods.

For a *grey shade* on warps weighing about 1000 lbs, the following quantities for instance are required:

- | | |
|------------------|---|
| 2 lbs | Diamine Dark Blue B |
| $\frac{1}{2}$ lb | Diamine Catechine B |
| $\frac{1}{4}$ lb | Diamine Fast Yellow B dissolved in |
| 25 gallons | boiling hot water as free from lime as possible and |
| 30 lbs | desicc. Glauber's salt dissolved in |
| 25 gallons | boiling water in a separate vessel. |

The dyeing is conducted in a hot bath as described above; the warps are then squeezed off, frequently also sized straightaway without rinsing, and dried.

The warps may then be rinsed with cold water by passing through a rinsing vat adjoining the dye vat.

Deep shades are dyed in the same manner, except that about $\frac{1}{3}$ — $\frac{1}{2}$ of the dyestuff and Glauber's salt solutions are added at the beginning of the dyeing operation, and that the dyeing is done in 4—6 passages; the goods are finally rinsed cold, passing a rinsing vat once or twice.

When dyeing in large continuous dyeing machines consisting of several compartments, 2 or 3 of these are filled equally with the same dye liquor, the warps passing the baths once or twice, while the liquor is replenished during the passage in proportion to the quantity absorbed by the warps.

For a *black* to be dyed with *Oxy Diamine Black JEI extra conc.*, the bath is prepared as follows:

Charge each partition per 10 gallons of liquor with

$1\frac{1}{4}$ — $1\frac{1}{2}$ lbs Oxy Diamine Black JEI extra conc.

$1\frac{1}{2}$ —3 oz soda ash

1 — $1\frac{1}{2}$ lbs desiccated Glauber's salt,

replenishing this bath during the passage with

3— $3\frac{1}{2}$ %	Oxy Diamine Black JEI extra conc.	} calculated on the weight of the cotton to be dyed.
3—4 %	desiccated Glauber's salt	

After dyeing, the warps are rinsed as customary.

AFTERTREATMENT WITH METALLIC SALTS.

The warps are dyed as above described, rinsed, and aftertreated with the metallic salts mentioned on page 11 and 12, then rinsed once more. For the aftertreatment a second vat with a rinsing vat adjoined is used. On account of the short passages, the baths for the aftertreatment should be somewhat stronger than given in the general part (with $1\frac{1}{2}$ —5 oz metallic salts and acetic acid per 10 gallons).

DIAZOTISING AND DEVELOPING.

In order to produce a *diazotised black*, the warps are dyed in the roller-box shown on page 178, the dyebath being charged as follows for 100 lbs of warps in about 130 gallons liquor:

13 lbs Oxy Diaminogene OT, dissolved in
22 gallons hot water (as soft as available);
further,
35 lbs desiccated Glauber's salt, dissolved in
22 gallons water.

When dyeing in the standing bath, about

4—4½ % Oxy Diaminogene OT
3—5 % desiccated Glauber's salt } of the weight of the
warps to be dyed

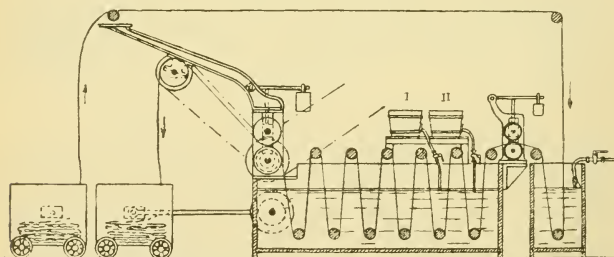
are necessary.

First $\frac{1}{2}$ — $\frac{1}{3}$ of the quantities of dyestuff and Glauber's salt are added and the previously boiled warps passed once through the boiling bath. Then the rest of the solutions is added and the dyeing completed, usually with 4—6 passages.

Dyeing being completed, the warps are rinsed in cold water.

The dyeing may however also be done in large continuous dyeing machines similarly as described for Oxy Diamine Black on page 179.

The diazotising and developing is carried out cold by giving one passage each in a vat provided with rollers and containing the diazotising, rinsing and developing liquors in the respective partitions; a machine of this kind is illustrated to some extent in the following sketch.



Two small wooden kegs (I and II) are placed above the diazotising vat, one containing the dissolved nitrite of soda, the other dilute hydrochloric acid. For 100 lbs of warps, the following quantities are required:

3 lbs nitrite of soda dissolved in
10 gallons water and
10 lbs hydrochloric acid mixed with
10 gallons water.

One-half of the two solutions in kegs I and II is run into the cold bath, and after entering the warps, the rest of the nitrite of soda and the hydrochloric acid solution, each separately, are allowed to run into the bath during the passage. The warps are squeezed off thoroughly, and rinsed in a second vat containing cold water and charged with $\frac{1}{4}$ — $\frac{1}{2}$ gallon hydrochloric acid: they are then squeezed off again, and developed straightaway.

The following are the quantities required for developing 100 lbs of warps

for a *black* with Phenylene Diamine:

0.7 lb Phenylene Diamine and
0.7 lb soda ash, dissolved in
10 gallons boiling water,

and for a *blue* (for instance *Diaminogene Blue*) to be developed with Beta Naphtol:

1 lb Beta Naphtol and
1.5—2 lbs caustic soda lye of 77° Tw.
dissolved in
10 gallons boiling water.

For developing, same as when diazotising, only one-half of the solution is added at the beginning and the rest gradually during the passage of the goods.

COUPLING.

The warps are dyed as indicated on page 178 and 179, rinsed, and then coupled with Nitrazol C or diazotised Parauitraniline, in one or two passages.

For 100 lbs of warps in about 130 gallons liquor,

4—6 lbs Nitrazol C or
9—13 gallons diazotised Parauitraniline solution
1—1½ lbs soda ash
4—6½ oz acetate of soda are required.

The coupling is carried out cold; during the passage the following solutions are made to run, each separately, into the bath from small kegs placed above the vat, viz:

a) A solution of

4 lbs Nitrazol C in
10 gallons cold water or
9 gallons diazotised Parauitraniline
solution mixed with cold water.

b) A solution of

1 lb 1½ oz soda ash and
5 oz acetate of soda in
10 gallons water.

After coupling, the warps are rinsed thoroughly in hot water, and may be soaped.

AFTERTREATMENT WITH FORMALDEHYDE.

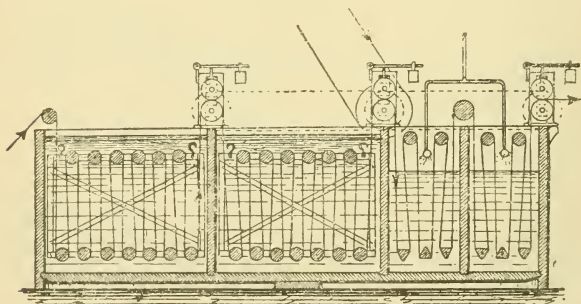
The warps are dyed as indicated on pages 178 and 179, rinsed, and then treated in the rinsing vat or a second vat by one or two passages with

3 —5 oz formaldehyde and	} per 10 gallons
1½—5 oz bichrome	

in a boiling hot bath, then rinsed once more.

DYEING WITH IMMEDIAL COLOURS.

With Immedial Colours, warps are generally dyed by one or two passages in large continuous machines containing two or three boxes for the dye liquors, the necessary



rinsing vats being arranged in close proximity thereto. When dyeing the bright blue colours, some guiding rollers are adjusted between the dyeing and rinsing vats to allow of the goods being oxidised in the air.

The afore sketch shows a warp-dyeing machine of the kind most in use which may serve for the dyeing of any of the Immedial Colours.

The first two boxes contain the dye liquor, the third the liquor for rinsing; each box is provided with effective squeezing rollers. For dyeing Immedial Indone some guiding rollers are fixed between the second and third boxes to allow of an air passage for oxidising.

The small warp-dyeing machine of which a sketch is given on page 178 may also be used in some instances, provided that small squeezing rollers are fixed on top of the guiding rollers and that another vat is added for rinsing.

When dyeing warps with Immedial Colours, the dye-baths must be of such a concentration as to allow even of deep shades being dyed with one passage because it is not advisable to pass the warps repeatedly.

PREPARATION.

When dyeing at or near the boil, the warps usually need not be boiled out: for light shades however boiling out is advisable and may be done as stated on page 179.

DYEING.

The Immedial Colours are mostly dyed with their own weight of sodium sulphide and the other ingredients as stated on pages 25 to 34 of the general part, particular care being taken to thoroughly dissolve the dyestuff.

For the aftertreatment with acetate of soda necessary for black warps see page 36.

Below are some examples:

1. Black produced with Immedial Carbon B.

Charge the dyebath with

1—1¼	lbs Immedial Carbon B	} per 10 gallons liquor
2—2½	lbs sodium sulphide crystals	
5—8	oz soda ash	
2—3	lbs desiccated Glauber's salt or common salt	

and replenish it during the dyeing with

5	—	6	%	Immedial Carbon B	} calculated on the weight of the warps to be dyed.
10	—	12	%	sodium sulphide crystals	
0.2	—	0.5	%	soda ash	
0	—	5	%	desiccated Glauber's salt or common salt	

The warps are passed through the boiling dyebaths, being squeezed after each passage by means of the squeezing rollers. They are then rinsed thoroughly, for preference by fresh water flowing into the rinsing boxes. It is recommended to add 5—8 oz acetate or formate of soda per 10 gallons liquor to the last rinsing bath. If the warps are dressed immediately, this addition may be made to the dressing.

2. Black produced with Indo Carbon.

Charge the dyebath with

1½	—	2	lbs	Indo Carbon S or SF	} per 10 gallons liquor
3	—	4	lbs	sodium sulphide crystals	
5	—	8	oz	soda ash	
				2 lbs desiccated Glauber' salt or common salt	

and replenish it during the dyeing with

7	—	8	%	Indo Carbon S or SF	} calculated on the weight of the warps to be dyed.
14	—	16	%	sodium sulphide crystals	
0.2	—	0.5	%	soda ash	
0	—	5	%	desiccated Glauber's salt or common salt	

Dye the warps in a boiling hot bath with either one or two passages, squeeze off well, and rinse, if possible with warm water.

Then aftertreat in one passage in a rinsing vat, or some other vat. with about 5 oz bichrome and 5—8 oz acetic acid per 10 gallons, and rinse.

The rinsing with acetate and formate of soda required for the other Sulphide Blacks is not necessary in the case of Indo Carbon S and SF.

3. Blue produced with Immedial Direct Blue
or Immedial Indogene.

Charge the dyebath with

$\frac{1}{2}$ — $1\frac{1}{2}$ lbs	Immedial Direct Blue "extra conc." or Immedial Indogene	} per 10 gallons liquor
1—3 lbs	sodium sulphide crystals	
4—8 oz	soda ash	
0— $1\frac{1}{2}$ lbs	desiccated Glauber's salt or common salt	

and replenish it during the dyeing with

2 — 8 %	Immedial Direct Blue "extra conc." or Immedial Indogene	} calculated on the weight of the warps to be dyed.
4 — 16 %	sodium sulphide crystals	
0.2— 0.5 %	soda ash	
0 — 3 %	desiccated Glauber's salt or common salt	

Dye the warps as given above for Immedial Carbon B, then squeeze off, and rinse.

The brightness of the shade may be enhanced by an air passage between the squeezing and rinsing, or by an aftertreatment with metallic salts or Immedial Developer (in another vat, or in the rinsing vat) as indicated on page 37.

4. Blue produced with Immedial Indone.

Charge the dyebath with

$\frac{1}{2}$ — $1\frac{1}{2}$ lbs	Immedial Indone	} per 10 gallons liquor
1—3 lbs	sodium sulphide crystals	
4—8 oz	soda ash	
0— $1\frac{1}{2}$ lbs	desiccated Glauber's salt or common salt	

and replenish it during the dyeing with

2 — 8 %	Immedial Indone	} calculated on the weight of the warps to be dyed.
4 — 16 %	sodium sulphide crystals	
0.2— 0.5 %	soda ash	
0 — 3 %	desiccated Glauber's salt or common salt	

The warps, which have been previously boiled or wetted out and then whizzed or squeezed off, are dyed

with one passage at 40—60° C. (105—140° F.). After dyeing, they are squeezed off well, given an air passage over about 10—20 yards, and rinsed.

5. Blue produced with Immedial Blue or Immedial New Blue.

The dyebath is charged with

1	—1½ lbs	Immedial Blue “extra conc.” or	} per 10 gallons liquor
		Immedial New Blue G conc.	
2	—3 lbs	sodium sulphide crystals	
1½	—3 oz	caustic soda lye of 77° Tw.	
0	—1½ lbs	desiccated Glauber’s salt or	}
		common salt	

and replenished during the dyeing by adding

4	— 7 %	Immedial Blue “extra conc.” or	} calculated on the weight of the warps to be dyed.
		Immedial New Blue G conc.	
8	—14 %	sodium sulphide crystals	
0.1	— 0.2 %	caustic soda lye of 77° Tw.	
0	— 3 %	desiccated Glauber’s salt or	}
		common salt	

The warps are dyed in a boiling bath and squeezed off well and evenly. The blue as a rule is then developed without rinsing previously, by smothering or by steaming with the admission of air, according to the instructions on page 37; the final rinsing is best done hot.

Immedial Blue and Immedial New Blue may also be rinsed straightaway after the dyeing and squeezing off, if necessary being developed by an aftertreatment with metallic salts or Immedial Developer according to the directions on pages 35 and 37.

6. Brown, Green, Olive and Mode Shades.

The dyebath is charged, according to the depth of shade desired, with

1½	oz	—1½ lbs	dyestuff	} per 10 gallons liquor
4½	oz	—1½ lbs	sodium sulphide crystals	
		3—4½ oz	soda ash	
		0—1½ lbs	desiccated Glauber’s salt	
			or common salt	

and replenished during the dyeing with

1	—	9	%	dyestuff	} calculated on the weight of the warps to be dyed.
3	—	9	%	sodium sulphide crystals	
0.1—	0.2	%		soda ash	
0	—	3	%	desiccated Glauber's salt or common salt	

Dye in a boiling hot bath with one or two passages, squeeze off well, and rinse immediately.

AFTERTREATMENT WITH METALLIC SALTS.

The aftertreatment of warps dyed with Immedial Colours is carried out with the metallic salts enumerated on page 35, the baths being charged more strongly on account of the short duration of the treatment.

DYEING OF HYDRON COLOURS.

Warps are dyed with Hydron Colours in either one or two passages in a continuous dyeing machine of the kind shown on page 182 with 1—2 compartments for the dyebaths, and rinsing vats adjoining. Some guiding rollers are to advantage adjusted between the dyeing and rinsing vats to allow of the goods oxidising in the air.

For Hydron Blue G and R Powder, the dyebaths are charged as follows:

<i>For light and medium shades:</i>				<i>For deep shades:</i>					
Dyestuff	1½—4½	oz	} per 10 gallons liquor.	6	—	9	oz	} per 10 gallons liquor.	
Hydrosulphite conc.									
Powder	5	—12		oz	1	—	1½		lbs
Caustic soda lye									
77° Tw.	5	—12	oz	1	—	1½	lbs		

During the dyeing the dyebaths are strengthened with

<i>For light and medium shades:</i>				<i>For deep shades:</i>				
Dyestuff	0.7	—	2.4 %	} reckoned on the weight of the warps to be dyed.	3	—	4 %	} reckoned on the weight of the warps to be dyed.
Hydrosulphite conc.								
Powder	1.75—	6	%		7.5—	10	%	
Caustic soda lye								
77° Tw.	1.75—	6	%		5	—	8 %	

For Hydron Blue G and R Paste 20%, the dyebaths are charged as follows:

For light and medium shades: For deep shades:

Dyestuff	$\frac{1}{2}$ — $1\frac{1}{2}$ lbs	} per 10 gallons liquor.	2 — 3 lbs	} per 10 gallons liquor.
Hydrosulphite conc.				
Powder	5 — 12 oz		1 — $1\frac{1}{2}$ lbs	
Caustic soda lye				
77° Tw.	5 — 12 oz		1 — $1\frac{1}{2}$ lbs	

During the dyeing the dyebaths are strengthened with

For light and medium shades: For deep shades:

Dyestuff	3.5 — 12%	} reckoned on the weight of the warps to be dyed.	15 — 20 %	} reckoned on the weight of the warps to be dyed.
Hydrosulphite conc.				
Powder	1.75— 6%		7.5—10 %	
Caustic soda lye				
77° Tw.	1.75— 6%		5 — 8 %	

Add the caustic soda lye and the dyestuff at 50—60° C. (120—140° F.), stir in the hydrosulphite gradually in powder form, or for preference dissolved in cold water, and stir well until the liquor is completely yellow. (Regarding the reduction of the powder product to a paste see page 4).

The warps, previously boiled, or well wetted. and then whizzed or squeezed off, are dyed at 50—60° C. (120—140° F.), squeezed off very well and evenly, passed through the air, and rinsed thoroughly.

If there are no guiding rollers for the air passage, the warps after the squeezing off are rinsed straightaway and then left lying for a few hours in a wet condition. The oxidation may be accelerated by an aftertreatment with perborate in a warm bath; for fuller particulars see also the general part, page 44.

COMBINATIONS OF VARIOUS DYESTUFFS.

A) TOPPING OF DIAMINE, IMMEDIAL AND HYDRON COLOURS WITH BASIC COLOURS.

The topping of warps is done in the same machines as the dyeing. The cold or lukewarm bath is charged with 3—8 oz acetic acid per 10 gallons liquor, and about one-tenth to one-twentieth of the requisite weight of the well dissolved dyestuff, the remainder of the colour solution being added gradually during the passage of the warps.

The topping is frequently also done together with the dressing, the previously well dissolved dyestuff being added to the dressing size.

B) TOPPING OF DIAMINE, IMMEDIAL AND HYDRON COLOURS WITH INDIGO.

The warps are dyed, rinsed, and topped with Indigo in accordance with the respective directions. The Hydron Blues may also be dyed together with Indigo in one and the same bath. See page 72.

C) TOPPING OF HYDRON BLUE WITH DIAMINE OR IMMEDIAL COLOURS.

For shading or saddening purposes, the Hydron Blues may be topped in the ordinary manner with Diamine or Immedial Colours. See page 45.

DYEING OF WARPS IN THE DRESSING.

Light and medium shades are frequently dyed in the dressing machine, especially in the case of cheap goods. Deep shades are likewise dyed in this way, but less frequently.

This may be carried out by two methods, viz:

A. The warps are dyed in the dressing paste.

B. The warps pass first one or several troughs containing the dyestuff solution, and are then run through the dressing paste.

A. DYEING IN THE DRESSING.

Diamine Colours are mostly used for dyeing in the dressing, but Acid Colours, such as Brilliant Croceine, Water Blue, Isamine Blue, as also Basic Colours and Immedial Colours may likewise be employed.

DYEING WITH DIAMINE COLOURS.

The dyestuff is dissolved in the customary manner in boiling water and added to the dressing, which for Diamine Colours should best be neutral or slightly alkaline, but not acid; the dressing is then boiled up again or stirred thoroughly.

The addition of ingredients frequently used for weighting, such as magnesia salts, china clay, etc., is not advisable, or should be reduced to a minimum; soap, fats and similar ingredients may however be added at will. When producing deep shades it is an advantage to add also some salt.

We give in the following some recipes for the production of a few shades with Diamine Colours by dyeing in the dressing.

In a suitable receptacle (wooden vat, copper kettle, etc.), the dressing is for instance prepared as follows:

Stir together in the customary manner

100 gallons	water
60— 80 lbs	potato starch
5 lbs	tallow
3½ lbs	wax

and boil up well.

Dissolve in another vessel,

for producing a linen shade:

9	oz	Oxy Diamine Brown 3GN
6½	oz	Diamine Dark Blue B
5	oz	Diamine Fast Yellow B
in about 10	gallons	water as free from lime as possible;

for a flax shade:

14½	oz	Oxy Diamine Brown 3GN
8	oz	Diamine Fast Yellow B
8	oz	Diamine Dark Blue B
in about 10	gallons	water as free from lime as possible;

for a light brown:

24	oz	Diamine Catechine G
4	oz	Diamine Catechine B
in about 10	gallons	water as free from lime as possible;

for navies:

10	lbs	Diamine Black BH
2½	lbs	Oxy Diamine Violet B
in about 20	gallons	water as free from lime as possible, and further
10	lbs	desicc. Glauber's salt dissolved in
about 10	gallons	water;

for black :

20	lbs	Oxy Diamine Black JB extra conc. dissolved in
about 20	gallons	water as free from lime as possible, and further
20	lbs	desicc. Glauber' salt dissolved in
about 10	gallons	water.

Add the dyestuff solution and the salt solution to the dressing, and boil up well.

It is not generally necessary to boil the warps previous to dyeing in the dressing; the warps as a rule pass the boiling hot size once as they come from the warp beam, or twice if deep shades are to be dyed. They are then squeezed off thoroughly by means of the squeezing rollers, and dried straightaway on the drying drums.

DYEING WITH IMMEDIAL COLOURS.

When dyeing in the dressing, the Immedial Colours only come into consideration for light shades to satisfy exacting requirements for fastness. For this purpose the following Immedial Colours are the best suited, and can be applied also in copper vessels or with copper rollers, drums, etc.

For Blue and Violet:

Immedial Indone B	double for Printing
Immedial Indone R	” ” ”
Immedial Direct Blue B	” ” ”
Immedial Indone Violet B	” ” ”

For Green and Olive:

Immedial Green BB	double for Printing
Immedial Green GG	” ” ”
Immedial Deep Green G	” ” ”
Immedial Olive 3G	” ” ”
Immedial Yellow Olive 5G	” ” ”

For Yellow and Orange:

Immedial Yellow D	double for Printing
Immedial Yellow GG	” ” ”
Immedial Orange C	” ” ”

For Brown, Claret, etc.:

Immedial Brown BR	double for Printing
Immedial Dark Brown A	” ” ”
Immedial Cutch O	” ” ”
Immedial Bordeaux GF	” ” ”
Immedial Maroon B	” ” ”
Immedial Prune S	” ” ”

For Grey:

Immedial Carbon B for Printing.

These dyestuffs are dissolved with about twice their weight of grape sugar (glucose) and their own weight of caustic soda lye 77° Tw., at the boil, in as soft water as possible; this solution is added to the dressing, the whole being then boiled up well.

When dyeing Immedial Colours in the dressing, the latter should be neutral or alkaline, same as for the Diamine Colours; any considerable additions of mineral ingredients for weighting purposes should likewise be avoided, but some salt may be added in order to better exhaust the liquor.

Grey and khaki shades may be dyed as, per the following examples:

For Grey, per 100 gallons dressing paste:

3 lbs Immedial Carbon B for Printing,

6 „ grape sugar (glucose) and

3 „ caustic soda lye of 77° Tw.

are dissolved boiling hot in about 10 gallons of as soft water can be had.

For Khaki, per 100 gallons dressing paste:

5 lbs Immedial Yellow Olive 5G double for printing,

2 „ Immedial Dark Brown A double for printing.

1 „ Immedial Cutch O double for printing,

16 „ grape sugar (glucose) and

8 „ caustic soda lye of 77° Tw.

are dissolved boiling hot in about 10 gallons of as soft water can be had.

Separately,

10 lbs desiccated Glauber's salt or common salt
are dissolved in

about 10 gallons water.

The dyestuff and the salt solutions are then added to the dressing, the whole is boiled up well, and the dyeing carried out as described above for Diamine Colours.

DYEING WITH ACID AND BASIC COLOURS.

These are dissolved as stated on page 4 and then added to the dressing paste which must not be alkaline when employing these dyestuffs.

B. DYEING AND SUBSEQUENTLY DRESSING.

Only Diamine, Immedial and Hydron Colours are dyed by this method, which yields colours faster to washing, water, and finishing than when dyeing in the dressing itself; weighting materials, such as China clay, or Epsom salts, may be added to the size.

In following this method, the dyebaths should be prepared in a sufficiently high concentration to allow of producing the desired shade with one passage; when

producing deep shades it is well also to add some Glauber's salt or common salt.

The dye trough is for instance charged per 10 gallons liquor:

For Cream, with Diamine Colours:

6 drams Diamine Fast Yellow FF
 1½ „ Diamine Orange G.

For Grey, with Diamine Colours:

1½ oz Diamine Dark Blue B
 5 drams Diamine Catechine B.

For Light Blue, with Diamine Colours:

4 oz Diamine Sky Blue FF
 8 oz desiccated Glauber's salt.

For Red, with Diamine Colours:

2 lbs Diamine Fast Scarlet 4BFF
 2 lbs desiccated Glauber's salt.

Dyestuff and salt are dissolved separately and added to the hot bath, the whole being then boiled up.

For Light Brown, with Immedial Colours.

1 lb Immedial Brown BR double for printing and
 3 oz Immedial Cutch O double for printing

are dissolved with

2 lbs 6 oz grape sugar (glucose) and
 1 lb 3 oz caustic soda lye 77° Tw.

in water as soft as can be had.

The grey warps, which as a rule are not boiled out, are passed through the dye liquors, squeezed off, then passed straight through the dressing squeezed off again, and finally dried straightaway.

HOSIERY DYEING
(STOCKINGS AND HOSE).

DYEING OF HOSIERY

STOCKINGS, HOSE, ETC.*

I. DYEING OF STOCKINGS.*

Vessels. Stockings are usually dyed in the same kinds of wooden vat as are used for yarns (see page 66); the dye-vessels are for preference fitted with a perforated false bottom to ensure uniform boiling and good turning. Occasionally also copper or iron kettles are used, the latter in dyeing Immedial Black.

Preparation for the Dyeing. Before dyeing, it is best to boil the stockings with 3—5% soda ash or 2—3% caustic soda. For light shades the stockings are moreover turned inside out before the dyeing or boiling. Deep shades on low-class goods or Blacks may be dyed without previous boiling, the dry material being entered straight into the dyebath. For light or brilliant shades, the material frequently has to be bleached. This is effected in the customary manner by first boiling the stockings as indicated above, then rinsing, and treating the goods for a few hours in hypochlorite of soda of $\frac{3}{4}$ —1° Tw.; the goods are then rinsed once, soured off with hydrochloric acid of about $\frac{1}{3}$ ° Tw., rinsed over again, and to advantage finally soaped hot at the boil.

Dyeing. Light and medium shades are almost exclusively dyed direct with *Diamine Colours*; deep shades are also dyed direct with *Diamine Colours*, or, if the requirements for fastness to washing are rather exacting, with *diazotised* or *coupled Diamine Colours*, and also with *Immedial Colours*.

For stockings, the same dyestuffs as a rule are used as in the dyeing of cotton hanks, particulars regarding which will be found on pages 100—119.

* Regarding machine-dyeing see page 132.

For current fancy shades, however, the following products are applied, which are distinguished also by their good fastness to acids and hot pressing:

For Brown:

Leather Brown:

Diamine Brown 3G

Oxy Diamine Brown KS

shaded with

Diamine Fast Yellow B, A, FF

Diamine Orange G

Diamine Dark Blue B

Diamine Black BH

Oxy Diamine Brown KMS, KBS, KRS, 3GN.

Tan Shades:

Oxy Diamine Brown KBS, KRS, KMS

shaded with

Diamine Fast Yellow B, A, FF

Diamine Dark Blue B

Diamine Brown 3G

Oxy Diamine Brown KS.

For Navy Blue:

Diamineral Blue R, BF, CV, CVB

Diamine Black BH

Diamine Azo Blue 2R

shaded with

Oxy Diamine Violet BF.

For Lilac and Violet:

Diamine Heliotrope B, O

Oxy Diamine Violet BF

shaded with

Diamine Fast Scarlet 4BFF, GFF, 8BN.

For Green and Olive:

Diamine Green B, CL

Diamine Dark Green N

shaded with

Diamine Fast Yellow B, FF, A

Diamine Brown 3G

Oxy Diamine Brown 3GN, KS, KBS.

For Grey and Mode Shades:

Combinations of
 Diaminogene extra
 Diamine Fast Yellow B
 Diamine Catechine B.

For Black:

Simplest and cheapest method of production:
 Oxy Diamine Black JB, JW, JE, JWF, JWN, A,
 FFC extra conc.
 Oxy Diamine Carbon JB, JEI.
 Of good fastness to acids:
 Para Diamine Black B, BB, FFB, FFD, FF extra conc.

For higher Demands of Fastness to Washing:

For Brown:

Diamine Nitrazol Brown G, GF, T	} coupled with Nitrazol C.
Oxy Diamine Brown G, RN	
shaded with	
Diamine Fast Yellow A	
Diamine Nitrazol Green GF, BB, S	
Diamine Nitrazol Black B, BB	
Oxy Diamine Black JW	

For Navy Blue:

Diamine Azo Blue R, RR, 6R	} diazotised and developed with Beta Naphtol.
Diaminogene Blue BB, NB, NA, 2RN, 3RN, 6RN	

For Red and Claret:

Diamine Azo Scarlet A, B, 4B, 8B	} diazotised and developed with Beta Naphtol.
Diamine Azo Bordeaux B	

For Black:

Diaminogene B, BR, BW	} diazotised and developed with Phenylene Diamine, or Phenylene Diamine and Beta Naphtol, or Resorcine.
Oxy Diaminogene OT, OB, FFN	
Diamine Black DB, DN	
Immedial Black NNG conc., NBB conc.	
Immedial Carbon B, JHJ, R	
Immedial Brilliant Black 5BV conc., 6BG conc., SBC conc.	
Immedial Brilliant Carbon F, FG.	

DYEING WITH DIAMINE COLOURS.

The stockings, wetted according to the directions on page 197, are dyed in a somewhat more dilute liquor than yarn in the hank, light shades with the addition of $\frac{1}{2}\%$ soda, $\frac{1}{2}$ —1% Turkey-red oil, Monosolvol or soap, by entering the stockings into the lukewarm bath prepared with all the ingredients, and then heating gradually to 60—70° C. (140—160° F.) and turning well.

Medium and deep shades are dyed at the boil with the addition of $\frac{1}{2}\%$ soda, 1—2% Turkey-red oil, Monosolvol or soap, and, varying with the depth of shade, with 10—15% desiccated Glauber's salt. For dyeing in the standing bath, about 0.1% soda, $\frac{1}{4}$ — $\frac{1}{2}\%$ Turkey-red oil, etc., and 2—3% salt will prove sufficient.

When working continuously on the standing bath, it is advisable to twaddle it as indicated on page 6.

In the case of stockings with a seam it is preferable to add the dyestuff and the Glauber's salt in several portions, and such stockings should be boiled somewhat longer in order that the seams may be well penetrated.

After dyeing, the goods are rinsed well; for brown and other deep shades some common salt or Epsom salts are sometimes added to the last rinsing bath, such shades frequently too being raised with acid. The above dyestuffs are especially well suited for the latter purpose, and other well suited products are mentioned on page 79. Black as a rule is brightened in a lukewarm bath with soap and oil or fat.

When dyeing dense shades, especially Browns, Olives or Blues, it may happen that the dyeings turn out irregularly, i. e. some places lighter, and others deeper and redder.

This is to be attributed mainly to dyeing in too concentrated baths, insufficient rinsing after dyeing, and imperfect removal of the rinsing liquor after the rinsing. In order to obviate this drawback, it is necessary in the first place to avoid working in too concentrated baths, to rinse well after the dyeing, and to hydroextract thoroughly.

It is further an advantage to add to the last rinsing water 3—5% common salt or Epsom salts, or some acetic acid, particularly when rinsing with soft water. When using acetic acid, dyestuffs fast to acids should be employed.

Such irregular lots are put right by soaping with 3—4 oz soap per 10 gallons warm water, rinsing lukewarm, and adding common salt or acetic acid to the last rinsing bath.

The following recipes may serve as an indication for the dyeing of stockings:

Leather Brown of good fastness to acids and hot pressing may for instance be dyed as follows:

For 100 lbs of stockings in about 250 gallons liquor.

The stockings are boiled for 1 to 2 hours with 3—5% soda, rinsed, and then dyed with

- 3 lbs Diamine Brown 3G
- 2 „ Diamine Fast Yellow B
- $\frac{1}{4}$ „ Diamine Dark Blue B
- $1\frac{1}{4}$ „ soda ash
- $1\frac{1}{4}$ „ Monosolvol
- 30 „ desiccated Glauber's salt.

Add the soda to the boiling hot bath, then the Monosolvol and half the weight of the dyestuff and salt, turn the goods in the liquor, and dye boiling hot for 10 to 15 minutes; then add the remainder of the dyestuff, and after a few minutes' boiling the salt, dyeing altogether for 1 to $1\frac{1}{2}$ hours. Then rinse well, add 10 lbs common salt to the last rinsing bath, hydroextract well, and dry.

Diazotised Blacks are for instance dyed as follows:

100 lbs stockings in about 250 gallons liquor.

- $7\frac{1}{2}$ lbs Oxy Diaminogene OT or FFN
- $1\frac{1}{4}$ „ soda ash
- $37\frac{1}{2}$ „ desiccated Glauber's salt or common salt.

For subsequent lots, the following approximate quantities are added:

- $4\frac{1}{2}$ lbs Oxy Diaminogene OT or FFN
- $\frac{1}{4}$ „ soda ash
- 5 „ desiccated Glauber's salt or common salt.

Enter the previously wetted stockings at the boil, and dye for $\frac{3}{4}$ hour at boiling temperature; then work for another $\frac{1}{4}$ hour without steam, and rinse cold.

The diazotising is carried out in a cold bath charged with

- $3\frac{3}{4}$ lbs nitrite of soda and
- $7\frac{1}{2}$ „ hydrochloric acid of 32° Tw.

by working the stockings well for 10 to 12 minutes therein, and then rinsing for a short time in water slightly acidulated with about 1 quart hydrochloric acid per 100 gallons water.

For *developing*,

10 oz Phenylene Diamine are dissolved boiling hot
together with

10 oz soda ash

and then added to the cold developing bath, in which the goods are treated for another 10 minutes, then washed in cold, and several times over in warm, water.

The stockings are to advantage brightened finally with 4—8 oz soap and $\frac{3}{8}$ — $\frac{3}{4}$ oz olive oil, boiled together, per 10 gallons liquor; they are then dried straightaway without washing. The shade thereby gains in beauty, the goods at the same time assuming a soft and pliant feel.

The silky scroop is produced according to the directions on page 121.

DYEING WITH IMMEDIAL COLOURS.

For the dyeings of stockings with Immedial Colours wooden vats with a perforated bottom are used, same as for Diamine Colours; copper steam coils or other copper appliances must be avoided. Iron vessels are also used sometimes.

The dyebaths are charged in accordance with the directions on pages 25 to 34.

For Black, the dry material, and for fancy colours, the well boiled material, is entered into the dyebath charged with all the ingredients, and dyed for $\frac{3}{4}$ to 1 hour, being turned with sticks and kept submersed in the liquor. After dyeing, the stockings are lifted, pressed off lightly, and entered straight into a rinsing bath kept ready at hand and containing $1\frac{1}{2}$ —3 oz sodium sulphide crystals per 10 gallons liquor. The whole lot is worked therein for some time, and then rinsed again until the water runs off clear. The first rinsing water which contains a fair amount of dyestuff is to advantage used for replenishing the dyebath.

After thoroughly rinsing, the stockings are brightened lukewarm with soap, Turkey-red oil or Monosolvol. in the case of Black generally with

5—8 oz olive oil soap	} per 10 gallons liquor.
2—3 „ olive oil and	
2—3 „ soda ash	

For producing blue-blacks, Immedial Black NBB conc., Immedial Brilliant Black 6BG conc. or Immedial Brilliant Carbon F are used principally, whereas for jet black, chiefly Immedial Brilliant Carbon FG or Immedial Carbon B, JHJ and R come into consideration; these brands may also be used in combination with one another.

The bath may for instance for a good black be charged as follows:

70—75 lbs stockings in about 220 gallons liquor.

8—9 lbs Immedial Carbon B

16—18 „ sodium sulphide crystals

6 „ soda ash

2 „ Turkey-red oil or Monosolvol

50 „ Glauber's salt or common salt.

For further lots, add

3—3 lbs 10 oz Immedial Carbon B

6—7 „ 4 „ sodium sulphide crystals

8 „ soda ash

8 „ Turkey-red oil or Monosolvol

4 „ desiccated Glauber's salt.

Dye for $\frac{3}{4}$ to 1 hour at the simmer whilst keeping the stockings continually in motion and submersed in the liquor. After the dyeing, throw them into baskets, press off lightly, and rinse at once in lukewarm water. The first rinsing bath should contain 4 lbs sodium sulphide crystals and 4 lbs soda ash; then rinse cold, and again lukewarm, until the water runs off clear.

After thoroughly rinsing, whizz, brighten in a warm bath prepared with 6 lbs olive oil soap, 1 lb olive oil and 4 lbs soda ash, which are boiled thoroughly together, hydroextract straightaway without rinsing again, and dry.

For stockings with a silky scroop, the application of the diazotised colours (Oxy Diaminogene OT or FFN) is to be given the preference. If stockings dyed with Immedial Black are to be silk-scrooped, an addition of acetate of soda is absolutely essential. See pages 121 and 122.

DYEING WITH BASIC COLOURS.

Stockings are rarely dyed with Basic Colours; when used however for stockings, they are applied according to the directions given for cotton yarn.

Frequently however, in particular for Blacks, stockings dyed with Diamine or Immedial Colours are brightened with Basic Colours.

This is done in the customary manner by adding 3—5% acetic acid to the last rinsing bath after dyeing, developing, etc., working the stockings therein for a few minutes, throwing out, and then adding the Basic Colour in two or three portions; heat the bath until lukewarm, and only then brighten in the case of Black.

Regarding the dyeing of *mercerised stockings* see page 207.

II. DYEING OF HOSIERY GOODS.*

For the dyeing of cotton hose the ordinary wooden vats provided with a moveable winch are used.

Preparatory Treatment. Before dyeing, these goods are treated in the same manner as stockings; they are often boiled out and frequently also bleached. For deep shades on ordinary hose, the previous boiling or wetting may be omitted, same as for stockings.

Dyeing. Cotton hose is being used more and more for the most varied purposes, and the selection of suitable dyestuffs is frequently dependent on the purposes for which the goods are intended.

Same as for stockings, the direct dyeing Diamine Colours are the dyestuffs used almost exclusively for light and medium shades on hose; for glove material, the *Diamine Fast Colours* are employed in the first place.

For deep shades on goods required to answer more exacting demands for fastness to washing, for instance for garments, not only the direct dyeing Diamine and Diamine Fast Colours are used, but also diazotised, coupled Diamine Colours or such aftertreated with metallic salts, or again Immedial Colours, the latter mostly for Black.

DYEING WITH DIAMINE COLOURS.

These are dyed with the same additions as stated for stockings on page 200, light shades with the addition of soda ash, Turkey-red oil, Monosolvol or soap, and sometimes Glauber's salt, deep shades mostly with soda and salt alone.

On some kind of hose it may happen that the colour becomes irregular subsequently, like as mentioned in the case of stockings, to obviate which the same measures should be adopted as there recommended.

* Particulars for the dyeing of hosiery goods in machines will be found on page 122.

The *diazotising, coupling* and *aftertreatment* of the Diamine Colours are carried out according to the directions given in the general part.

The following recipe may serve as an example for the production of a good, current navy blue of excellent fastness to washing and light:

90 lbs cotton hose in 270 gallons water.

5 lbs Diaminogene Blue NB

2 lbs Diaminogene Blue NA

1 lb soda ash

30 lbs desiccated Glauber's salt or common salt.

For dyeing subsequent lots in the same bath, about the following additions should be made in order to produce the same shade:

3.5 lbs Diaminogene Blue NB

1 lb 5 oz Diaminogene Blue NA

3 oz soda ash

4 lbs desiccated Glauber's salt or common salt.

Prepare the dyebath with all the ingredients, boil up, and enter the well boiled hose; dye for $\frac{3}{4}$ hour near boiling temperature, work for 20 minutes without steam, and rinse in cold water.

The diazotising is done in a cold bath charged with

4 lbs nitrite of soda and

6 lbs hydrochloric acid of 32° Tw.,

by working the goods thoroughly for 10 to 12 minutes, rinsing for a short time in water slightly acidulated with hydrochloric acid (1 quart per 100—125 gallons water), and developing straightaway.

The goods are then developed as follows:

Mix 13 oz Beta Naphtol with

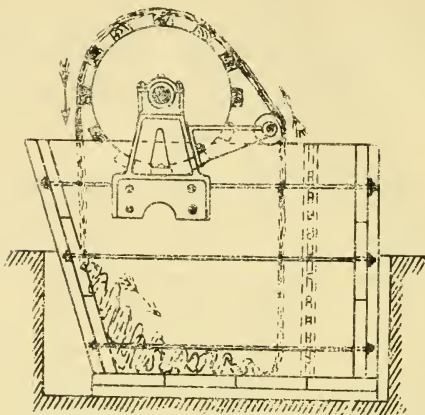
1 lb 4 oz caustic soda lye of 77° Tw.,

add the necessary quantity of boiling water, stir well, and add this solution to the cold developing bath; work for 10 to 15 minutes, wash once cold and then warm several times over, and soap boiling hot finally with 3—4½ oz soap per 10 gallons liquor.

DYEING WITH IMMEDIAL COLOURS.

Immedial Colours are used practically for Black only, and are dyed in wooden vats, like the Diamine Colours; care should however be taken that the movable winch is not fixed too high, but just above the level of the dyebath, as illustrated in the following sketch.

The vats must however contain no copper parts.



In dyeing, the goods must not be passed too often over the winch, once every 10 to 15 minutes being quite sufficient; during the rest of the time the goods should be kept well submersed in the liquor.

The dyebaths are to be charged in accordance with the directions stated in the general part on pages 25 to 34.

The previously boiled or wetted goods are dyed for 1 to 1½ hours near boiling temperature, then rolled up, and straightaway treated for 10 to 15 minutes in a warm rinsing bath containing 1½—3 oz sodium sulphide crystals per 10 gallons water; they are then rinsed in fresh water, and brightened in the case of Black.

Black, for instance, is dyed as follows:

For 100 lbs knit goods in about 300 gallons liquor, the first bath is charged with

- 15 lbs Immedial Brilliant Carbon FG
- 30 „ sodium sulphide crystals
- 10 „ soda ash
- 60 „ desiccated Glauber's salt

For dyeing subsequent lots in the standing bath, the following quantities approximately are required:

- 5½ lbs Immedial Brilliant Carbon FG
- 11 lbs sodium sulphide crystals
- 1 lb soda ash
- 6 lbs desiccated Glauber's salt.

Add to the dyebath the dyestuff previously dissolved with the sodium sulphide, and the soda and salt, boil up, and enter the goods which have been wetted with 2% soda for about ½ hour; dye for about ½ hour near boiling temperature by passing first for 10 to 15 minutes over the winch, then submersing in the liquor, and passing two or three times over the winch during the dyeing; then enter straightaway into a lukewarm rinsing bath containing 3 oz sodium sulphide crystals per 10 gallons water, complete the rinsing with water, brighten in a lukewarm bath with 8 lbs soap, 4 lbs olive oil and 6 lbs soda ash, which have been previously boiled up together hydro-extract, and dry.

DYEING WITH BASIC COLOURS.

For hosiery, same as for stockings, Basic Colours are seldom applied alone. They are used frequently however for topping, and are dyed in the same manner as described for stockings on pages 203 and 204.

III. DYEING OF MERCERISED STOCKINGS AND MERCERISED HOSE.

These are dyed exactly like ordinary goods except that the dyeing operation should be retarded, because mercerised goods possess a greater affinity for dyes than non-mercerised goods; for light and medium shades especially, the addition of salt should be entirely omitted, whereas for deep shades or blacks a slight quantity of salt may be added.

Light shades are dyed with *Diamine Colours*, by entering the goods into the dyebath at 30—40° C. (85—105° F.), and raising the temperature gradually during ½ hour to 60—70° C. (140—160° F.); in the case of medium and deep shades enter the goods at 50—60° C. (120—140° F.), and heat then gradually to boiling temperature.

Immedial Colours are dyed likewise without or with but little salt, the quantity of sodium sulphide being for preference increased.

It is always an advantage to add 1—2% Turkey-red oil, Monosolvol or soap, calculated on the weight of the material; otherwise the same directions hold good as given for mercerised yarn; see page 77.

Goods which are to be silk-scrooped should for preference be dyed with the dyestuffs enumerated on page 79.

A jet black of the shade of the Aniline oxidation black, and very useful for stockings to be strongly silk-scrooped, is dyed according to the following recipe:

100 lbs mercerised stockings in about 250 gallons liquor.

6—7 lbs Diaminogene B	} diazotised and developed with Phenylene Diamine or Diamine BB.
1 lb soda ash	
2 lbs Turkey-red oil	
20 lbs desiccated Glauber's salt	

For dyeing subsequent lots in the standing bath, add approximately:

4 lbs Diaminogene B	} diazotised and developed with Phenylene Diamine or Diamine BB.
½ lb soda ash	
1 lb Turkey-red oil	
2 lbs desiccated Glauber's salt	

Boil up the dyebath with all the ingredients, enter the stockings into the hot bath, dye for $\frac{3}{4}$ hour near boiling temperature, without boiling, allow to feed for 15 to 20 minutes in the cooling bath, and rinse in cold water.

After dyeing and washing, diazotise and develop in the manner customary for stockings, as described on page 201.

For black mercerised stockings, Oxy Diaminogene OT and FFN, likewise developed with Phenylene Diamine or Diamine BB, are used in addition to Diaminogene.

For further details regarding the dyeing and brightening, see the general directions for mercerised yarns (pages 77—86) and for silk-scrooping, see the directions on pages 121 and 122, which apply equally here. See also the directions on page 203.

DYEING OF PIECE-GOODS.

DYEING OF PIECE-GOODS.

PREPARING THE GOODS.

The preparing of the pieces depends entirely on the character of the goods.

Dyeing without any Preparation: Cheap articles, linings, etc., especially in grey, black and other dark shades, are frequently dyed straightaway without any further preparatory treatment. It is recommended in such case to enter the dry goods straight into the boiling dye-bath.

Singeing: Most goods are singed before dyeing in order to remove the flue from the face of the fabric.

Wetting out the Goods: In certain cases where goods have not been bowked before dyeing, it is an advantage to wet them out first in a boiling bath to which

3—4½ oz soda ash and	} per 10 gallons
¾—1½ oz Turkey-red oil or	
Monosolvol	

have been added. The goods may then be dyed direct without further rinsing.

Bowking and Bleaching: Better-class goods are generally bowked after the singeing, and are as a rule also bleached for pale and bright shades.

The bowking is usually carried out with either caustic soda lye or with soda in kiers, in which the boiling may be done under pressure. After the boiling, the goods are rinsed, soured, rinsed again, and entered wet into the dye-bath.

If bleaching be required, it is carried out with a weak solution of chloride of lime, and a subsequent souring with hydrochloric acid.

Malting (Freeing from the Dressing): Cotton velvets, corduroys, moleskins, heavily sized twills, etc. are immersed for several days in large vats filled with warm water in

order to produce a fermentation of the dressing, to accelerate which a little malt, yeast or Diastafor ($1\frac{1}{2}$ —3 oz per 10 gallons) may be added. After this operation, the goods are rinsed well and then dyed.

This treatment is also frequently applied with advantage to goods which are to be bowked subsequently; in the case of light materials it is sufficient to treat them overnight.

The malting with Diastafor is frequently also carried out in the padding machine or in the jigger. The pieces pass several times the warm bath (not exceeding 70° C. or 160° F.) charged with Diastafor; they are then allowed to lie for several hours, or better still over night, rolled up or covered well, being then before dyeing rinsed thoroughly, or boiled again with the addition of some soda or caustic soda lye.

Velveteens, cords or similar goods, which will not stand the pressing of squeezing rollers, are frequently also malted in the padding machine with the same additions.

Mercerising: Most satteens, italians, serges and cotton cloths are subjected to the customary mercerising process. As a rule the goods come in a dry state from the singeing to the mercerising; it is better however to free them from size beforehand either by bowking or by fermentation, and these processes are preferred by some mills.

The mercerising is done in cold caustic soda lye of 52° Tw. by padding with the lye in a padding machine provided with efficient squeezing rollers and then stretching on a tentering frame.

During the passage on the frame the goods are sprayed with hot water, then washed in hot water, soured, and again rinsed with hot water. If the mercerised goods are to be bleached, this is carried out in the usual way after the mercerising.

Some mills also reverse the way of working, the goods being mercerised after the bleaching.

Mild Mercerising: With certain goods for which gloss is of less importance than obtaining a better affinity or a special handle, it has been found an advantage to pass

the materials before dyeing through a weak caustic soda lye bath; in such cases the goods are taken through a caustic soda lye bath of 12—18° Tw., rinsed without stretching, and dyed as usual.

Other Methods of Preparation: In addition to these general methods of treatment, some special methods are adopted for certain kinds of material, of which the following may just be mentioned here.

Heavy twills and moleskins are frequently rubbed with emery on the right side in order to remove husks and burls, taken through the cropping machine and then dyed, or wetted out well in a soda bath previous to the dyeing.

Cotton dress materials, umbrella cloths and damasks as well as italians, previous to the dyeing and after the singeing, are crabbed on the ordinary crabbing machine provided with squeezing rollers, the pieces passing through a hot bath charged with soda; they are then steamed for a short time, and dyed.

I. DYEING WITH DIAMINE COLOURS.

Piece-goods are dyed:

- A. in the Jigger,
- B. in the Padding Machine,
- C. in the Continuous Dyeing Machine,
- D. in the Dye Vat.

A. DYEING IN THE JIGGER.

According to the depth of shade,

$\frac{3}{4}$ —3 oz soda ash and
4 oz—2 lbs cryst. Glauber's salt } per 10 gallons liquor

are used along with the requisite quantities of dyestuff.

First add the soda to the dyebath, boil up, then add half the requisite quantity of dyestuff previously well dissolved in hot water. Enter the goods, and add the remainder of the dyestuff after the first passage. The Glauber's salt is likewise added in two portions, at the beginning of the third and fourth passages.

Dye deep shades at the boil, light shades at 50—60° C. (120—140° F.), in 4—8 passages according to the size of the batch to be dyed.

In the case of light shades the quantities of dyestuff used are all but absorbed, whereas about a quarter to one-third remains in the bath when dyeing medium and dark shades so that in dyeing subsequent lots it is only necessary to add two-thirds to three-quarters the quantities of dyestuff used in the first instance; one-quarter of the above quantities of soda and Glauber's salt is likewise sufficient.

In the case of very light shades it is best to omit the Glauber's salt altogether, or to add 1½—3 oz Turkey-red oil or Monosolvol per 10 gallons liquor, such addition being conducive to better and easier levelling and penetration.

For light shades the dyestuff is best added in 3 to 4 portions.

Certain dyestuffs such as *Diamine Yellow N* and *Diamine Fast Yellow 3G*, or sometimes very light shades

of the other Diamine Colours, are dyed with the addition of $1\frac{1}{2}$ —3 oz soap and 4—12 oz phosphate of soda per 10 gallons liquor at a temperature of 70—80° C. (160 to 175° F.).

The dyestuffs enumerated on page 6 (top) are dyed to better advantage without any soda, in other respects as above.

For the subsequent shading, the easily levelling dyestuffs mentioned on page 9 are used.

B. DYEING IN THE PADDING MACHINE.

Dyeing by Several Passages. When dyeing in the padding machine by several passages, the machine is provided with a rather large trough; the same ingredients are then added as when dyeing in the jigger, and the method of dyeing is also the same.

Padding. When working according to the second method, the padding machine is provided with a small trough holding but a small volume of liquor. In this case $1\frac{1}{2}$ —3 oz Turkey-red oil or Monosolvol, per 10 gallons liquor, and the requisite dyestuff are added, both previously well dissolved, the solution being so prepared as to yield the correct shade in one or two passages. The dry material previously freed from size passes the trough, as much dye solution being added during the padding as is actually absorbed by the goods. In some cases 5 oz—1 lb dextrine per 10 gallons liquor are added in the place of Turkey-red oil.

Any of the Diamine Colours may be used for padding. For producing light and difficult mode shades, the dyestuffs mentioned on page 9 should be used.

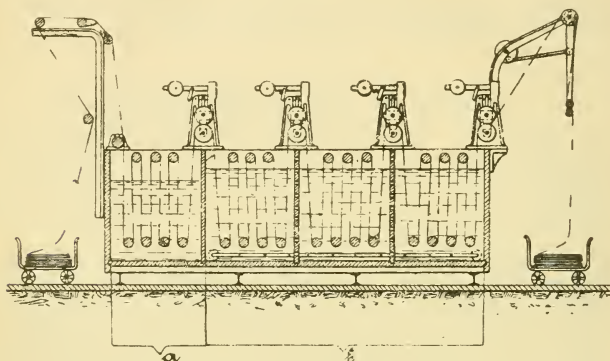
Dyeing in the Finish. This third method consists in dyeing the goods during the finishing. The dyestuff, previously well dissolved, is added straight to the finishing mass, and boiled up well with the latter, working in just the same manner as when finishing in the ordinary way, the goods being passed once or twice through the liquor. (The finishing paste should contain no filling material such as china clay, magnesium salts, etc.).

For this process the same dyestuffs are used as for padding.

C. DYEING IN THE CONTINUOUS DYEING MACHINE.

In the continuous dyeing machine mostly staple shades such as Black, Brown, Dark Blue, etc. are dyed.

Black for instance is dyed in a roller box containing four compartments, constructed as shown in the accompanying sketch:



Each compartment is provided with squeezing rollers, the upper ones in each case being coated with rubber; openers are fixed before each pair of rollers. The liquor is heated by means of *indirect steam*.

The grey goods are boiled in the first compartment (a), which is charged with 3 lbs soda ash and freshened up during the passage with $\frac{1}{2}\%$ soda ash of the weight of the dry pieces. This bath turns rapidly brown and dirty owing to dissolved size and other impurities, and is therefore renewed twice daily.

The three dyeing compartments (b), with a combined capacity of about 650 gallons liquor, are charged with equal quantities of dye liquor, for instance with

1½ lbs Para Diamine Black FFB extra conc.	} per 10 gallons liquor
or Oxydiamine Black JW extra conc.	
dissolved together with some soda	

and replenished during the passage with

3—3¼ % Para Diamine Black FFB extra conc. or
Oxy Diamine Black JW extra conc.
of the weight of the goods to be dyed.

For a daily output of 100 pieces of a total weight of about 2650 lbs, the additions required for keeping the bath at its full strength are:

88 lbs Para Diamine Black FFB extra conc. or
Oxy Diamine Black JW extra conc.

13 lbs soda dissolved in

130 gallons water,

and after each piece has passed, 1¼ gallon of this solution is added, equally divided between the three compartments.*

The speed of the machine is so regulated as to allow the pieces to remain for about three minutes in contact with the liquor.

Having passed through the machine, the goods are laid off in a truck and rinsed when cold. It is an advantage to let the goods lie for a little while without rinsing, but the rinsing should not be unduly delayed, as it is less easy then to clean the goods thoroughly.

D. DYEING IN THE DYE VAT.

Certain kinds of goods such as corduroy, crepon, satteen, italians, etc. are frequently dyed also in the vat.

The dyeing is carried out in a volume of water about 30 to 40 times the weight of the material to be dyed, with the same ingredients as for the dyeing of yarn; see pages 5 and 64 and following pages.

AFTERTREATMENT WITH METALLIC SALTS.

The aftertreatment with metallic salts may be carried out in the jigger or the padding machine, likewise also in the vat or the continuous dyeing machine, according to the general instructions on pages 10 to 12.

* These machines are as a rule provided with a small automatic meter which rings a bell after each 100—120 yards have passed through the machine, thus indicating when the colour solution is to be added. It is, however, not of very great importance that the addition be made at perfectly regular intervals since small deviations therefrom have no detrimental effect on account of the high concentration of the bath.

In the continuous dyeing machine, the aftertreatment can be applied immediately in connection with the dyeing, by adding two further vats, one for the aftertreatment and the other for rinsing.

The bath for the aftertreatment is charged rather more strongly than in the case of jigger dyeing, say, with $1\frac{1}{2}$ — $4\frac{1}{2}$ oz sulphate of copper or bichrome and $1\frac{1}{2}$ — $4\frac{1}{2}$ oz acetic acid per 10 gallons liquor, which is applied hot; the goods are then rinsed thoroughly.

DIAZOTISING AND DEVELOPING.

This process may be carried out in the jigger, in the vat or in the continuous dyeing machine.

1. DIAZOTISING AND DEVELOPING IN THE JIGGER.

The dyed and thoroughly rinsed goods are diazotised in one jigger and developed in another. Between the two operations, the goods are given a short rinsing, the water being slightly acidulated with hydrochloric acid. Either a special rinsing jigger is employed for this purpose, or the diazotising jigger is filled with fresh water, the goods being rinsed once therein and then entered direct into the developing bath.

Diazotising. This is generally done with the same additions as stated on page 14; with large rolls, $\frac{1}{2}$ to $\frac{2}{3}$ rds of the quantities stated there are sufficient. Give 2 to 4 passages (10 to 20 minutes), rinse, and develop.

Heavy goods which are difficult to penetrate for preference are first given two passages with nitrite, the hydrochloric acid being added subsequently.

In order to avoid streaky and spotty shades the goods during the diazotising and developing should be protected from direct sunlight, and should furthermore not be left lying undeveloped but be rinsed and developed at once after the diazotising.

Developing. This is done with the same additions as stated on pages 14 to 16, large batches with but one-half or two-thirds of these quantities.

At the beginning, add half the quantity of the developer to the developing bath, and the rest after the first passage, developing cold with two to four passages (10 to 20 minutes). Then either rinse at once, or let the goods lie for another $\frac{1}{2}$ to 1 hour after developing. The goods are frequently also given a hot soap or soda bath finally in order to enhance the brightness of the shades.

2. DIAZOTISING AND DEVELOPING IN THE DYE VAT.

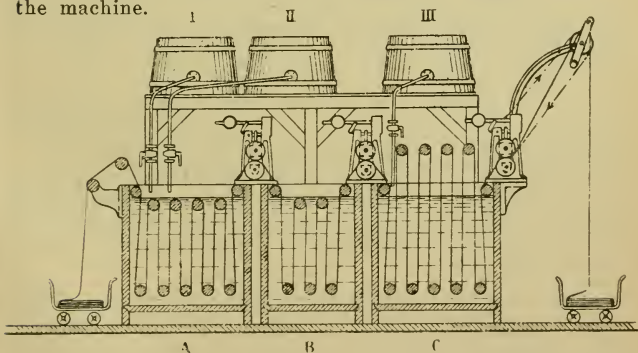
Diazotising. Work the dyed and rinsed goods first for 10 to 15 minutes in the diazotising bath charged as stated on page 14. Then run off this bath, and rinse the goods cold for several minutes with the addition of a little hydrochloric acid.

Developing. The goods are developed immediately after the rinsing, without any further delay, being worked for 10 to 15 minutes in the developing bath charged with the same additions as stated on pages 14 to 16.

3. DIAZOTISING AND DEVELOPING IN THE CONTINUOUS DYEING MACHINE.

The diazotising and developing of large lots of piece-goods in the continuous dyeing machine has given excellent satisfaction, because these operations may be carried out easily in one passage.

The following sketch illustrates the construction of the machine.



(A) is the diazotising box, which is charged with the nitrite and hydrochloric acid, and is fed from the two reservoirs I and II.

(B) is the rinsing box containing acidulated water.

(C) is the developing box which is replenished from reservoir III.

The reservoirs are tubs placed above the machine, which serve for feeding the latter continuously. No I contains the nitrite solution, No II dilute hydrochloric acid, both for feeding box (A), whilst No III contains the developing solution for feeding box (C).

The diazotising box is half filled with water to which

2½ oz nitrite of soda and
8 oz hydrochloric acid

per 10 gallons of liquor are added for the first lot. The two tubs Nos I and II are charged, according to the weight of goods to be diazotised, with

1% nitrite	} of the weight of the dry material.
3% hydrochloric acid	

During the passage of the pieces through the machine, nitrite and hydrochloric acid are run separately from reservoirs I and II into the diazotising box, the flow of the two liquids being so regulated that they are absorbed as soon as the pieces have passed the machine.

The liquids need not flow continuously, but the taps of the reservoirs may be closed, if it is indicated from the gauge glasses that in proportion to the diazotised goods too much nitrite or hydrochloric acid has been allowed to run out.

The proper condition of the diazotising bath may be judged by the smell, i. e., the bath should always smell slightly, but not pungently, of nitrous acid.

If the fumes of nitrous acid should cause inconvenience in the dye-house, a trouble which can hardly occur with correct working, a hood to carry off the fumes may be fixed above the diazotising box or it may be covered tightly with a lid.

The washing box (B) is provided with running water, and some dilute hydrochloric acid is added from time to time during the passage, so that the rinsing water is always slightly acid.

The developing bath (C) is charged, according to the developer employed, as follows:

I. Developing with Phenylene Diamine. For the first charge the developing box is half filled with water, and per 10 gallons of liquor

$\frac{2}{3}$ oz Phenylene Diamine	}	previously dissolved
$\frac{3}{4}$ oz soda ash		

are added. The upper tub III is besides charged, according to the quantity of the goods to be developed, with

0.5% Phenylene Diamine	}	of the weight of the dry pieces,
0.5% soda ash		

which are run into the developing box during the passage of the pieces. It is immaterial whether the solution runs in continuously or intermittently as long as the above mentioned quantity of developer is approximately added during the passage.

II. Developing with Phenylene Diamine and Resorcine.

The dyeing is done as above, the first developing bath being charged per 10 gallons of liquor with

$\frac{1}{3}$ oz Phenylene Diamine dissolved in water
 $\frac{1}{3}$ oz Resorcine dissolved in water with
the addition of
 $\frac{3}{4}$ oz caustic soda lye 77° Tw.

The upper tub for replenishing is made up with

$\frac{1}{4}$ % Phenylene Diamine dissolved in water	}	of the weight of the dry pieces.
$\frac{1}{4}$ % Resorcine dissolved in water with the addition of		
$\frac{1}{2}$ % caustic soda lye 77° Tw.		

III. Developing with Phenylene Diamine and Beta Naphtol.

The dyeing is done as above, the first developing bath being charged per 10 gallons of liquor with

$\frac{1}{3}$ oz Phenylene Diamine dissolved in water
 $\frac{1}{2}$ oz Beta Naphtol dissolved in water with
the addition of
 $\frac{3}{4}$ oz caustic soda lye 77° Tw.

The reserve tub is charged for replenishing with:

0.25% Phenylene Diamine	}	of the weight of the dry pieces.
0.30% Beta Naphtol dissolved in water with the addition of		
0.50% caustic soda lye 77° Tw.		

IV. Developing with Beta Naphtol. The dyeing is done as above, the first developing bath being charged per 10 gallons of liquor with

2½ oz Beta Naphtol dissolved in

2½ oz caustic soda lye 77° Tw.

and the upper tub for replenishing is charged with

0.6% Beta Naphtol

1.5% caustic soda lye 77° Tw. } of the weight of the dry pieces.

The dyed and rinsed goods are passed through the diazotising and developing box, remain unwashed for some time (about ½ to 1 hour) and are then rinsed.

COUPLED DYEINGS.

For coupling pieces previously dyed with Diamine Colours, two passages in a *jigger* charged with Nitrazol or diazotised Paranitraniline are sufficient. The starting bath is in both instances charged, per 10 gallons liquor, with:

3¼ oz Nitrazol C or 27/8 pints diazotised

Paranitraniline C

2/3 oz soda ash 2/3 oz soda ash

1/3 oz acetate of soda 1/3 oz acetate of soda,

adding besides varying with the depth of shade to be produced:

3—6½ oz Nitrazol C or 27/8—5¾ pints diazotised

Paranitraniline C

¾—1½ oz soda ash ¾—1½ oz soda ash

3/8—1/2 oz acetate of soda 1/2—2/3 oz acetate of soda

per 10 lbs of material.

When coupling large lots, the above quantities may be reduced by about one-third.

The diazotised Paranitraniline is prepared as described on page 19.

For thick material difficult to penetrate it has been found an advantage to give two passages first with Nitrazol alone, and only then to add the soda and acetate of soda, divided over two passages.

When coupling in the *padding machine*, approximately the same quantities of coupling liquor are used as when working in the *jigger*. Frequently coupling is done in

the *padding machine*, in exactly the same manner as the developing of Paranitraniline Red. In such case the same diazo solution is used as for red, the diazotising bath being diluted according to requirements, only one-third to one-fourth the quantity of the diazo solution used for the dyeing of red being added for coupling. The goods are given two passages, one-half of the requisite diazo solution being added with each passage.

Having passed the cold coupling bath, the pieces are batch or plaited down, and, after the lapse of $\frac{1}{2}$ to 1 hour, rinsed as usual.

For shading purposes, Basic Colours may be added straightaway to the coupling bath; thus for instance, black dyeings are as a rule shaded with about

0.25% Methylene Blue BB.

If the dyeings have been produced by padding in the padding machine, a method finding special favour among the print works, the goods after the padding are for preference batched for several hours, and then passed before rinsing through a cold Glauber's salt bath of about 7° Tw. The coupling is then carried out in the padding machine in the customary manner.

Producing Coupled Black in the Continuous Dyeing Machine.

Dye in the same manner as stated for direct black (page 216), but reducing the quantities of dyestuff materially.

Charge the starting bath with

$\frac{3}{4}$ —1 lb Oxy Diamine Black JW extra conc.	} per 10 gallons liquor.
$\frac{3}{4}$ oz soda ash	

For replenishing the bath, $2\frac{1}{4}$ — $2\frac{1}{2}$ % Oxy Diamine Black JW extra conc., calculated on the weight of the dry cotton, are added during the passage of the goods.

After dyeing, rinse the goods, and couple in another vat containing Nitrazol and some Methylene Blue. The coupling bath is charged in the same manner as when working in the jigger. The shading with Methylene Blue may also be done subsequently in a fresh bath.

II. DYEING WITH IMMEDIAL COLOURS.

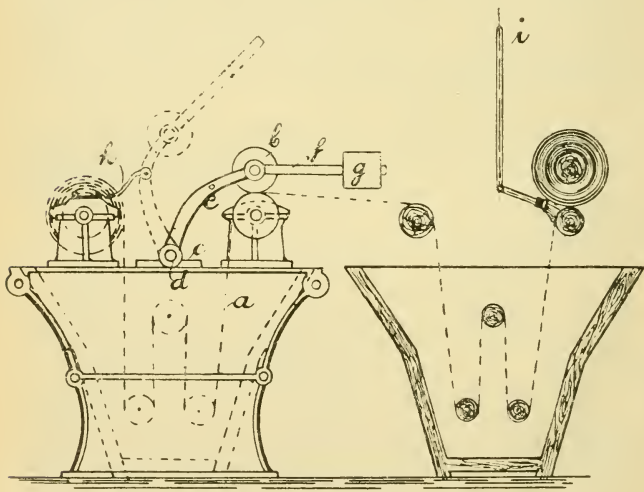
These may be dyed

- a) in the Jigger,
- b) in the Padding Machine,
- c) in the Continuous Dyeing Machine,
- d) in the ordinary Dye Vat,

none of these must contain any parts made of copper or brass.

DYEING IN THE JIGGER.

This is the method most generally applied for Immedial Colours. The so-called "Immedial Jiggers" are for preference used for this purpose, such as are built by every machine works for textile machines, and which differ from the ordinary jigger only in as far as they are provided with squeezing rollers. The latter may however be fitted to any ordinary jigger available, according to the following sketch.

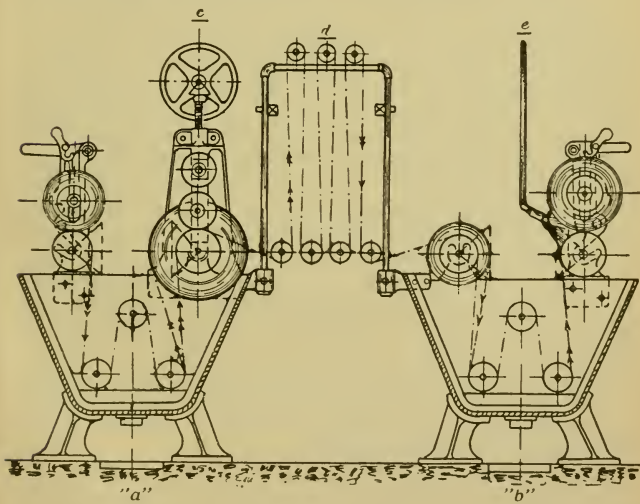


The narrow ends (a) of the jigger are fitted with two bearings (c) which carry a shaft (d). To each end of the shaft, right and left, a lever (e) is affixed immoveably

by means of a rabbet and wedge carrying the squeezing roller *b*. The levers *e* extend beyond the roller-bearing through the arms *f*, which may be weighted with the weights *g*. When not in actual use, the whole arrangement is thrown back into the position shown by the dotted lines, and is there arrested by means of a bolt which passes through an eye in arm *h*. The sprinkler *i* is arranged at the rinsing jigger as shown in the sketch on page 226.

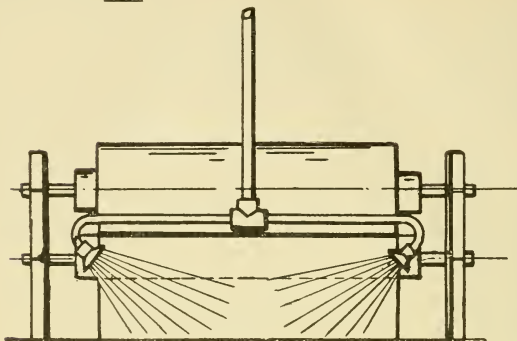
During the dyeing, the squeezing rollers are turned out of use over the jigger, the dyeing being carried out as customary; only during the last passage the squeezing roller is put into action, the goods passing between the rollers, straight into the rinsing bath, without being batched.

For dyeing Immedial Indone it has been found an advantage to run the goods, between the dyeing and rinsing, for 12 to 24 yards over some guiding rollers for oxidising, as shown in the following sketch.



The squeezing rollers in this sketch are pressed down by screw pressure regulated by the wheel *c*; in the first sketch this is done by lever pressure. *d* indicates the guiding rollers for the oxidation and *e* the sprinkler.

In the foregoing two sketches "a" represents the dye-jigger; jigger "b" is for rinsing only.



This sketch shows the sprinkling pipe adjusted in the rinsing jigger so as to give the goods a lively sprinkling on both sides before they are squeezed off.

The dyebaths are charged with sodium sulphide and salt in accordance with the particulars given on pages 25—34, except that for small bales the starting baths are charged with a little more dyestuff, for large bales on the other hand with a little less dyestuff than there indicated.

The goods to be dyed should be well freed from dressing and then beamed evenly, care being taken also during the dyeing that the goods are rolled up evenly.

The dyeing is effected by means of 6 to 8 passages in a warm or boiling bath. After the dyeing, the goods are squeezed off well, and rinsed, either immediately or after an oxidation in the air.

Light shades may also be dyed in the ordinary jigger if the goods, on completion of the dyeing, can be washed immediately in a good supply of water in a second jigger standing ready for the purpose.

Immedial Blue and *Immedial New Blue* are frequently developed by steaming or smothering, and when following these methods, the goods are only squeezed, but not rinsed. Further particulars of the *methods of developing* will be found on pages 35—39, and regarding the steaming or smothering on pages 239—241.

The following are a few examples from practice.

Black with Immedial Black.

5 pieces thin sateen, 45 lbs in weight, 22 gallons liquor:

	Starting bath:	Subsequent lots:
Immedial Black NNG conc.	8 lbs	$3\frac{3}{8}$ lbs
Sodium Sulphide crystals	8 lbs	$3\frac{3}{8}$ lbs
Soda ash	1 lb	0.1—0.2 lbs
Common salt or desiccated		
Glauber's salt	6½ lbs	1 lb

5 pieces of moleskin, 330 lbs dry weight, 45 gallons liquor:

	Starting bath:	Subsequent lots:
Immedial Black NNG conc.	30 lbs	21½ lbs
Sodium Sulphide crystals	30 lbs	21½ lbs
Soda ash	2 lbs	½ lb
Common salt or desiccated		
Glauber's salt	12 lbs	2 lbs

Give six to eight passages at boiling temperature, adding one-half of the ingredients at the beginning and the other half after the first passage. After the last passage the goods are squeezed off very thoroughly and run straight into the rinsing jigger where they are rinsed.

After having passed the rinsing jigger, the goods are washed in a washing machine or in the jigger until the wash water remains perfectly clear. Some 5 to 8 oz acetate or formate of soda per 10 gallons liquor are added to the last rinsing bath, the goods being then dried without any further rinsing.

Immedial Carbon is dyed in the same manner, but with one-and-a-half to double the quantity of sodium sulphide crystals as of dyestuff, reckoned on its weight.

Blue dyed with Immedial Direct Blue or Immedial Indogene.

5 pieces of twill, 45 lbs in weight, 22 gallons liquor:

	Starting bath:	Subsequent lots:
Immedial Direct Blue	according to depth of shade:	
B extra conc.	1 — $3\frac{3}{4}$ lbs	$\frac{2}{3}$ — $2\frac{1}{4}$ lbs
Sodium sulphide crystals	$3\frac{1}{2}$ — $7\frac{1}{2}$ lbs	$1\frac{1}{3}$ — $4\frac{1}{2}$ lbs
Soda ash	0.6 — 1 lb	0.1—0.2 lb
Common salt or desiccated		
Glauber's salt	1 — 4 lb	0.2—1 lb

5 pieces moleskin, 330 lbs in weight, 45 gallons liquor:

	Starting bath:	Subsequent lots:
	according to	depth of shade:
Immedial Direct Blue		
B extra conc.	5½—19½ lbs	5—16½ lbs
Sodium sulphide crystals	16½—39 lbs	10—33 lbs
Soda ash	1¼—2 lbs	¾—1 lb
Common salt or desiccated		
Glauber's salt	2 — 9 lbs	¾—2 lbs

Dye with 4 to 8 passages at boiling temperature. After the last passage, squeeze off thoroughly, and wash at once in the rinsing jigger.

Blue dyed with Immedial Indone.

5 pieces sateen, 45 lbs in weight, 22 gallons liquor:

	Starting bath:	Subsequent lots:
	according to	depth of shade:
Immedial Indone R conc.	1¾—7 lbs	7/8—3½ lbs
Sodium sulphide crystals	5¼—14 lbs	1¾—7 lbs
Turkey-red oil	2/3—1 lb	0.1—0.2 lb
Soda ash	2/3—1 lb	0.1—0.2 lb
Common salt or desiccated		
Glauber's salt	1—4 lbs	¼—1 lb

5 pieces moleskin, 330 lbs in weight, 45 gallons liquor:

	Starting bath:	Subsequent lots:
	according to	depth of shade:
Immedial Indone R conc.	8¾—33 lbs	6½—26 lbs
Sodium sulphide crystals	25—66 lbs	13—52 lbs
Turkey-red oil	1¼—2 lbs	3—6 oz
Soda ash	1¼—2 lbs	3—6 oz
Common salt or desiccated		
Glauber's salt	2—9 lbs	½—2 lbs

Dye at 50—60° C. (120—140° F.) with 4 to 8 passages. After the last passage, squeeze off, give an air passage, and at once enter into the rinsing jigger.

Blue dyed with Immedial Blue or Immedial New Blue.

5 pieces sateen, 45 lbs in weight, 22 gallons liquor:

	Starting bath:	Subsequent lots:
	according to	depth of shade:
Immedial Blue CR extra conc.	1 ³ / ₈ —4 ⁷ / ₈ lbs	7 ⁷ / ₈ —25 ⁵ / ₈ lbs
Sodium sulphide crystals	4—9 ³ / ₄ lbs	1 ³ / ₄ —5 ¹ / ₄ lbs
Caustic soda lye of 77° Tw.	5—10 oz	3 ³ / ₄ —1 ¹ / ₂ oz
Common salt or desiccated		
Glauber's salt	1—4 ¹ / ₂ lbs	1 ¹ / ₄ —1 lb

5 pieces moleskin, 330 lbs in weight, 45 gallons liquor:

	Starting bath:	Subsequent lots:
	according to	depth of shade:
Immedial Blue CR extra conc.	8 ¹ / ₂ —24 lbs	6 ¹ / ₂ —20 lbs
Sodium sulphide crystals	22—48 lbs	13—40 lbs
Caustic soda lye of 77° Tw.	5 ⁵ / ₈ —1 ¹ / ₄ lbs	3—6 oz
Common salt or desiccated		
Glauber's salt	2—9 lbs	3 ³ / ₈ —2 lbs

Dye in 4 to 8 passages at boiling temperature. The goods are not rinsed after dyeing, but thoroughly squeezed off and then developed by smothering or steaming with the admission of air, as per instructions on page 226; they are then rinsed hot.

If the blue is to be developed with the Immedial Developer or with bichrome and bisulphite, the goods must be rinsed previously.

The fastness of the blue may be further enhanced by an aftertreatment with copper sulphate and bichrome. For this purpose, the goods, when dyed and squeezed off, are likewise rinsed, and then aftertreated with

2% copper sulphate
0.5—1% bichrome
3 —4% acetic acid

at 60—80° C. (140—175° F.) in two passages, being finally rinsed once more. See also pages 31, 35 and 37—39.

Dyeing the other Immedial Colours.

Immedial Direct Blue (single strength brands), Immedial Cutch, Immedial Brown, Immedial Dark Brown, Immedial Yellow Brown, Immedial Red Brown, Immedial Prune, Immedial Maroon, Immedial Bordeaux, Immedial Violet, Immedial Purple, Immedial Olive, Immedial Green, Immedial Brilliant Green, Immedial Dark Green, Immedial Deep

Green, Immedial Green Blue, Immedial Orange, Immedial Yellow, Immedial Yellow Olive, and Immedial Khaki are dyed according to the instructions given for Immedial Direct Blue B extra conc., for the same weight of dyestuff only one-half of the stated quantity of sodium sulphide however being used; see tables on pages 28, 29, 32—34.

Immedial Brown BRS and Immedial Dark Brown DS are dyed by themselves without sodium sulphide, or in combination with other Immedial Colours with the amount of sodium sulphide necessary for the latter (page 33).

Immedial Indone Violet is dyed like Immedial Indone.

Combinations of Immedial Direct Blue with Immedial Indone are dyed like Immedial Indone, i. e., with a subsequent air passage. whereas all other combinations are simply dyed like Immedial Direct Blue or Immedial Black, and are rinsed immediately after the squeezing off.

LIGHT MODE SHADES WITH IMMEDIAL COLOURS

are dyed as stated above, except with an increased quantity of sodium sulphide and very little or no Glauber's salt.

Charge the bath approximately as follows:

1—6%	of the various dyestuffs	} calculated on the weight of the goods to be dyed.
4—8%	sodium sulphide crystals	
1—5%	soda ash	

Add to the bath in the jigger first the soda and then the dyestuffs dissolved in sodium sulphide, and dye at boiling temperature with 6—8 passages. In the case of deeper shades, add besides 5—10% Glauber's salt towards the end of the dyeing process; when dyeing goods that are difficult to dye through, it is well to add to the bath $\frac{1}{2}$ —1% Turkey-red oil or Monosolvol, of the weight of the goods.

The dyeings produced with Immedial Colours are without exception exceedingly fast to washing and acids. The fastness to light of most of the Immedial Colours is likewise most excellent, but this may be still further enhanced, especially in the case of the light shades, by an aftertreatment with copper sulphate and bichrome.

The goods are aftertreated for about $\frac{1}{2}$ hour at 60—80° C. (140—175° F.) with

1—2%	copper sulphate	} calculated on the weight of the goods
$\frac{1}{2}$ —1%	bichrome	
3—4%	acetic acid	

and finally rinsed.

The following are some recipes for the production of current mode shades.

Military Grey.

5 pieces of twill, weighing about 110 lbs, in 55 gallons liquor.

Charge the jigger with

1 lb soda ash
10 oz Turkey-red oil or Monosolvol
2½ lbs sodium sulphide crystals

giving the goods, previously well freed from dressing, two passages at boiling temperature; then add in two portions a solution of

10 oz Immedial Yellow Olive 5G,
10 „ Immedial Dark Green B.
7 „ Immedial Black NNG conc.
3 lbs sodium sulphide crystals,

and complete the dyeing at boiling temperature with 8—10 passages.

After the last passage, the goods are squeezed off evenly, and rinsed immediately in a second jigger ready to hand.

They are then aftertreated in a hot bath with

3 lbs bichrome
3 pints acetic acid

in 3—4 passages, and finally rinsed.

Khaki.

6 pieces twill, weighing 118 lbs, in 45 gallons water.

The goods previously freed from size, are boiled out with two passages in a bath charged with

1 lb soda ash
1 lb Turkey-red oil or Monosolvol
2¼ lbs sodium sulphide crystals

and then dyed with the addition of

for pale Khaki:

15¼ oz Immedial Yellow
Olive G
7¾ „ Immedial Cutch O
1½ lbs sodium sulphide
crystals

for deep Khaki:

28½ oz Immedial Yellow
Olive G
7¾ „ Immedial Yellow
Brown EN
15½ „ Immedial Brown RR
3½ lbs sodium sulphide cryst.

in 10—12 passages, squeezed off, and rinsed immediately with a plentiful supply of water.

The aftertreatment is carried out in a hot bath with

1 lb 10 oz copper sulphate

1 lb 10 oz bichrome and

2½ pints acetic acid

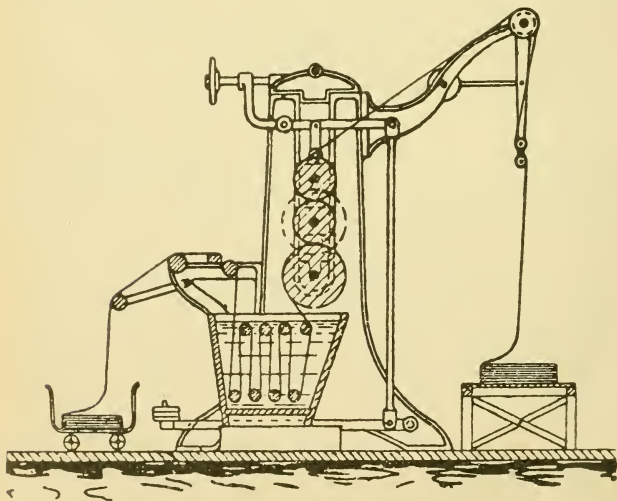
in 3—4 passages, finally rinsing the goods again.

DYEING IN THE PADDING MACHINE.

The dyeing in the padding machine may be carried out by two methods:

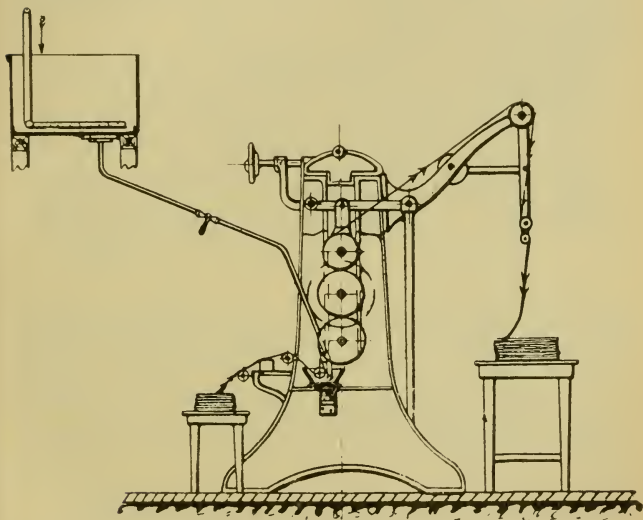
1. According to the Jigger Dyeing Method.

The goods prepared for dyeing, similarly as in jigger dyeing, are passed once or several times through a trough provided with several guiding rollers, then squeezed off, and cuttled, or rinsed straightaway; see following sketch.



2. According to the Padding Method.

This method has been found very serviceable, especially in large works. A padding machine is used which is provided with a very small trough. In a vessel placed on a higher level than the padding machine the liquor is prepared according to the shade required, and heated by indirect steam. During the dyeing this liquor flows continuously into the trough, for preference so as to become evenly distributed under the surface of the liquor; see following sketch.



The dyebath is charged as follows:

$\frac{3}{4}$ oz—	1 lb	dyestuff for light shades	} per 10 gallons liquor
1—	3 lbs	dyestuff for medium shades	
3—	6 „	dyestuff for dark shades	
8—10	„	Immedial Black conc. for Black	

as well as with double the amount of sodium sulphide crystals as of dyestuff and 3 oz Turkey-red oil or Monosolvol per 10 gallons liquor.

One passage is usually sufficient for dyeing the goods, two or more passages being required in the case of deeper shades only.

For black dyeing, it is recommended to add to the dyebath 8 oz dextrine and 8 oz Glauber's salt in addition to the quantities of dyestuff, sodium sulphide and Turkey-red oil above stated; two passages prove sufficient. When Blacks are to be produced exclusively, it is advisable to employ as big a trough as possible.

After dyeing, the goods are rinsed well, the black dyeings especially with the addition of 5—8 oz acetate or formate of soda per 10 gallons liquor to the last rinsing bath.

The following are a few examples:

Dyeing a Medium Blue in the Padding Machine

according to Method I.

The roller-box, holding about 45 gallons, is charged for about 100 lbs of goods with

8 lbs	Immedial Indone JBN conc.	} per 10 gallons liquor
16 lbs	sodium sulphide crystals	
$\frac{3}{4}$ pint	Turkey-red oil	

The goods, after being freed from dressing and again dried, are passed through this hot dye solution, squeezed off, passed through the air over several guiding rollers until the Blue has been developed, and cuttled, or rinsed.

According to the depth of shade required, the passage is repeated, either once or several times.

The bath may be freshened up by adding more concentrated dye solutions.

Dyeing of Mode Shades in the Padding Machine

according to Method II.

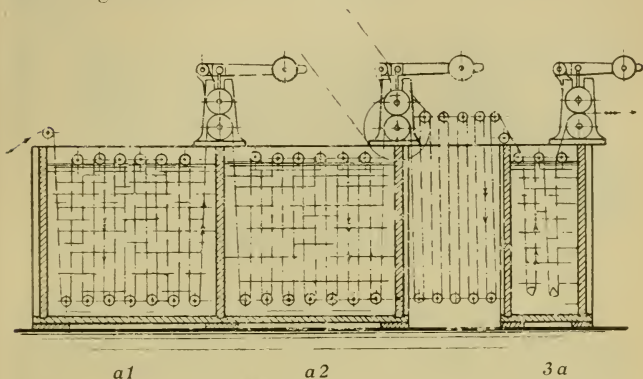
The stock solution is prepared for instance with

1 lb	Immedial Dark Brown D conc.	} per 10 gallons liquor
2 lbs	sodium sulphide crystals	
3 oz	Turkey-red oil	

The goods, which have been well freed from dressing and dried again, are passed through the hot dye solution, which is evenly fed into the small trough; they are then squeezed off, and rinsed.

DYEING IN THE CONTINUOUS DYEING MACHINE.

In the continuous dyeing machine, mostly staple shades such as black, blue etc. are dyed. The construction of a continuous dyeing machine to be recommended for the production of all kinds of shades is shown in the following sketch.



a1 and *a2* are two large roller-boxes, each holding about 660 gallons of dye-liquor. The partition wall between the two vats is perforated in places in order to keep the liquor in both at the same level; *a3* is a rinsing vat.

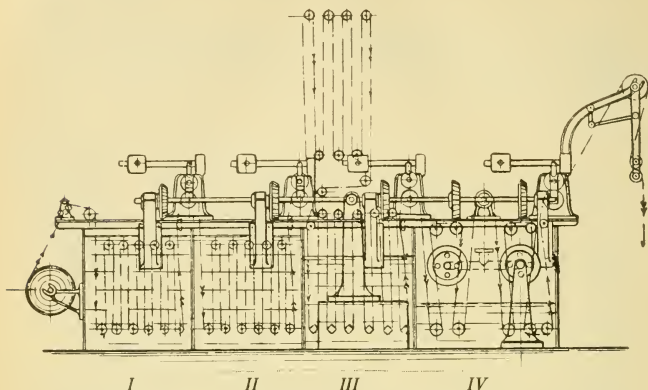
Each box is provided with efficient nippers, which are made of iron, and either both wrapped with cloth, or the upper one coated with rubber and the lower one covered with cloth.

Between *a2* and *a3* a system of guiding rollers is arranged, by means of which the goods coming from the dyebath and pressed off may be subjected to an oxidation in the air.

Openers are fixed where the goods enter the bath and in front of each pair of nippers in order to prevent the forming of folds.

The speed is so regulated as to allow about 16 to 22 yards to pass through the machine in a minute, about 11 000 to 13 000 yards thus being dyed in a working day of 10 hours.

A similar continuous dyeing machine is shown in the following sketch.



The first two vats contain the dye liquor, the third and fourth serving for the rinsing. Before the rinsing, the goods may be taken for oxidation over the guiding rollers arranged above the dyeing and rinsing vats.

The boxes may be made of either wood or iron, but the inside guiding rollers should always be of iron. The squeezing rollers may both be made of wood, or the lower of wood and the top one of iron, and, if required, coated with rubber; they are as usual covered with cloth. A closed iron steam coil serves for heating the bath.

For a passage lasting 3 to 4 minutes from the time of entering the goods until they leave the vat again, the following quantities are necessary:

Immedial Black.

Starting bath:

2	—2½ lbs	Immedial Black NNG conc.	} per 10 gallons liquor.
2	—2½ lbs	sodium sulphide crystals	
4	—8 oz	soda ash	
1½	—3 oz	Turkey-red oil	
2	—2½ lbs	common salt or desiccated Glauber's salt	

During the dyeing the bath is replenished with

5.5—6.5 %	Immedial Black NNG conc.	} calculated on the weight of the goods to be dyed.
5.5—6.5 %	sodium sulphide crystals	
0.5 %	soda ash	
0.5 %	Turkey-red oil	
1 — 2 %	common salt or desiccated Glauber's salt	

Dye at boiling temperature with only one passage. After thoroughly pressing off, enter the dyed goods into the adjoining rinsing vats, complete the washing in a small broad-washing machine quickly, giving finally a bath of 5—8 oz acetate or formate of soda per 10 gallons liquor.

Immedial Indone.

Starting bath:

6 oz—1½	lbs Immedial Indone	} per 10 gallons liquor.
12 oz—3	lbs sodium sulphide crystals	
3 oz—6	oz soda ash	
1½ oz—3	oz Turkey-red oil	
8 oz—2	lbs common salt or desiccated Glauber's salt	

During the dyeing operation the dyebath is replenished with

1.5— 8 %	Immedial Indone	} calculated on the weight of the goods to be dyed.
3 —16 %	sodium sulphide crystals	
0.5— 1 %	soda ash	
0.5 %	Turkey-red oil	
2 — 3 %	common salt or desiccated Glauber's salt	

Dye in one passage at 50—60° C. (120—140° F.). Having passed the two dye vats, the goods are passed for oxidising through the air over some guiding rollers fixed above the vat, and then entered into the rinsing bath.

Immedial Direct Blue or Immedial Indogene.

Starting bath:

5	oz—12	oz Immedial Direct Blue B extra conc.	} per 10 gallons liquor.
10	oz— 1½	lbs sodium sulphide crystals	
3	oz— 6	oz soda ash	
1½	oz— 3	oz Turkey-red oil	
5	oz— 2	lbs common salt or desiccated Glauber's salt	

During the dyeing, the bath is replenished with

2	—	5	%	Immedial Direct Blue B extra conc.	} calculated on the weight of the goods to be dyed.
4	—	10	%	sodium sulphide crystals	
0.5	—	1	%	soda ash	
		0.5	%	Turkey-red oil	
2	—	3	%	common salt or desiccated	
				Glauber's salt	

Dyed like Immedial Black near boiling temperature in one passage; the goods are then taken straight to the rinsing vats.

Immedial Blue or Immedial New Blue.

Starting bath:

6	oz—	12	oz	Immedial Blue CR extra conc.	} per 10 gallons liquor.
12	oz—	1½	lbs	sodium sulphide crystals	
6	oz—	8	oz	caustic soda lye of 77° Tw.	
1½	oz—	3	oz	Turkey-red oil	
8	oz—	2	lbs	common salt or desiccated	
				Glauber's salt	

During the dyeing the dyebath is replenished with

2	—	6	%	Immedial Blue CR extra conc.	} calculated on the weight of the goods to be dyed.
4	—	12	%	sodium sulphide crystals	
0.25	—	0.5	%	caustic soda lye 77° Tw.	
		0.5	%	Turkey-red oil	
2	—	3	%	common salt or desiccated	
				Glauber's salt	

The dyeing is conducted in one passage at boiling temperature. The goods are then squeezed off well, batched or cuttled, and, without being rinsed, developed either by smothering or by steaming with the admission of air; thereupon they are rinsed hot. Or, the goods are after-treated with Immedial Developer or metallic salts, in which case they are rinsed immediately on leaving the dyebath. The goods are again rinsed after the aftertreatment. See page 31 et seq.

AFTERTREATMENT OF THE IMMEDIAL COLOURS.

AFTERTREATMENT WITH METALLIC SALTS.

The aftertreatment with *bichrome*, *bichrome* and *copper sulphate*, or *bichrome* and *bisulphite* is described in the general part on page 35, and is carried out as there indicated.

AFTERTREATMENT WITH ACETATE OR FORMATE OF SODA.

This aftertreatment, important for black Immedial dyeings, those of Indo Carbon excepted, is carried out according to the indications in the general part, page 36.

AFTERTREATMENT WITH IMMEDIAL DEVELOPER.

The aftertreatment with Immedial Developer is applied both for a more rapid oxidation of the colours produced with Immedial Indone, Immedial Indogene or Immedial Direct Blue, and for developing Immedial Blue and Immedial New Blue. For fuller particulars see page 37.

**DEVELOPING OF IMMEDIAL BLUE AND IMMEDIAL NEW BLUE
BY STEAMING, SMOTHERING, OR TOPPING IN THE VAT.**

These methods of developing are discussed in the general part on pages 37—39. Regarding their application on piece-goods the following points have still to be observed:

Developing by Steaming.

The pieces are only pressed off after dyeing, not rinsed, then steamed straightaway without pressure.

For steaming, any steaming apparatus or closed wooden chest may be used. Together with the steam, air is blown in by means of an injector (particulars about adjusting the injector to be found on page 38).

The kinds of steamers usually employed are

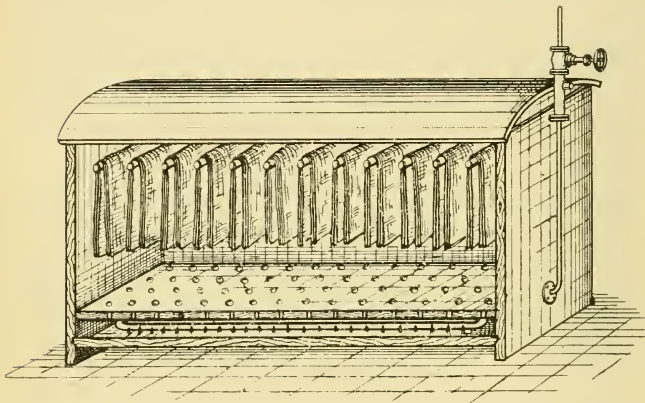
the ordinary steaming cottage,

customary in print works, in which the pieces are hung on sticks, and steamed without pressure, with admission of air, or a

wooden steam chest

as shown in the following sketch.

The wooden steam chest should be somewhat wider than the goods which are put over laths side by side. The height of the chest must be so provided as to leave a space of not less than 4—6 inches between the goods and the perforated false bottom. The steam is admitted near the bottom of the box in order to allow the condensed water to run off easily. The false bottom may also be covered with felting to prevent the goods from being spotted by spouting water.



The cover of the steam chest should be arched and also slightly overlapping, being covered inside with felting (nailed on to laths so as to leave a space between the cover and the felting).

If the steam carry too much water, this may be remedied by inserting at the bottom of the chest a closed steam coil, by which the box may be well heated previous to steaming.

During the steaming, which lasts $\frac{1}{2}$ to $\frac{3}{4}$ hour, great care must be taken to prevent any water from dropping on to the goods. The chest may, however, at any time be opened and closed again; thus the dyer may ascertain, if want of experience leaves him in doubt, whether the goods are thoroughly penetrated by the steam.

After steaming, the goods are rinsed in warm water and topped with Basic Dyestuffs if desired.

Developing by Smothering.

After dyeing and squeezing off, the pieces are passed a short way through the air and then beamed at once. The rolls of cloth are covered with a moist fore-runner or with a layer of oiled paper so as to prevent them from drying, and are left lying overnight in a room heated to 50—70° C. (120—160° F.). After developing, the goods are rinsed

In order to match Immedial Blue dyeings, an undeveloped pattern is taken for guidance, rinsed in cold water, passed through dilute acetic acid or a weak solution of alum, dried, and kept without further rinsing. This treatment fixes the shade permanently, and, the influence of the steaming always being the same, it is sufficient to match the undeveloped dyeings.

DYEING IN THE DYE VAT.

Only Blacks are usually dyed with Immedial Colours in the dye vat.

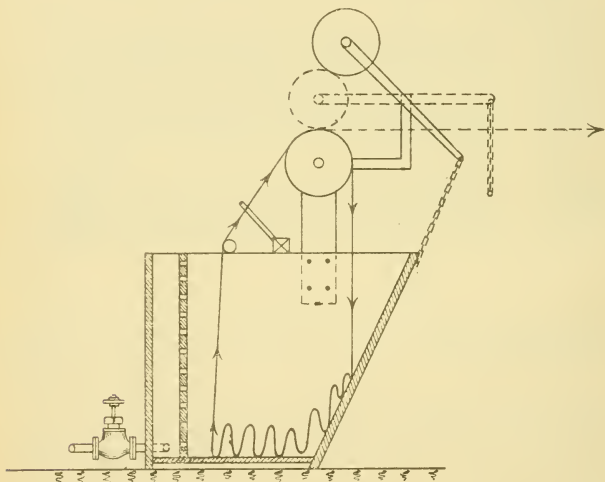
Two vats are used, placed alongside of each other, one for the dyeing and the other for rinsing.

The vat, as shown by the sketch on page 242, is calculated for 8—10 pieces of about 35—40 lbs each. A perforated wooden partition serves to keep the pieces from coming into direct contact with the steam pipe. The partition facilitates adding dye solution and salt during the operation. The vat is 4½ feet high, 10 feet broad, 5 feet wide above and 3¼ feet below. Eight to ten pieces may be dyed in rope form, passing parallel to each other over a guiding roller about 3" thick, and being separated by lattice work.

Above the vat a pair of wooden rollers of 1' 4"—1' 8" in diameter are arranged. The lower one serves in the first place for turning the goods; the upper one is kept raised during the dyeing by means of a lever and chain, and is only lowered when the pieces leave the bath to be squeezed off.

The rinsing vat, constructed on the whole in the same way as the dye vat, is provided with a spraying arrangement to intensify the effect of the rinsing. The squeezing rollers of the rinsing vat must run at the same speed as those of the dye vat.

The dyeing is carried out in the usual manner in accordance with the directions given below.



When the dyeing is complete, the pieces are separated, and then squeezed off by lowering the upper roller and setting the rollers of both the dye vat and rinsing vat in motion.

The goods are then rinsed in the rinsing vat in the usual manner with running water until clean.

To prevent a white coating from forming on the goods when working with very hard water, $\frac{3}{4}$ —1 gallon hydrochloric acid per 400—450 lbs goods are added to the rinsing bath towards the end of the rinsing. Finally, the goods are rinsed in clear water; for blacks 5—8 oz acetate of soda are added per 10 gallons to the last rinsing water.

In one vat, 4 lots of 10 pieces at 40 lbs may easily be dyed and rinsed *pro diem*.

Example for dyeing with Immedial Carbon.

10 pieces Mercerised Umbrella Cloth, 330 lbs,
in 660 gallons liquor.

Starting bath:

15% Immedial Carbon B
30% sodium sulphide crystals
2% soda ash
30% Glauber's salt crystals.

For subsequent lots:

6% Immedial Carbon B
12% sodium sulphide crystals
1% soda ash
5% Glauber's salt crystals.

Dye for one hour at the boil, and allow to feed for $\frac{1}{4}$ hour in the cooling bath. Squeeze off, and rinse, adding 5—8 oz acetate of soda per 10 gallons liquor to the last rinsing water.

DYEING WITH HYDRON COLOURS.

On piece-goods, Hydron Blue may be dyed

- a) in the jigger,
- b) in the padding machine,
- c) in the continuous dyeing machine,
- d) in the vat.

a) DYEING IN THE JIGGER.

For this purpose the customary jigger with squeezing rollers and arrangements for oxidising is used. Occasionally the jigger with the batch rollers submersed in the liquor is used, particularly for goods which are hard to penetrate.

The dyeing is carried out according to the following directions:

Hydron Blue G and R Powder.

<u>For light shades:</u>	Starting bath:	Subsequent lots:
Dyestuff	0.6— 2%	0.6— 1.6%
Hydrosulphite conc. Powder	3 — 6%	3 — 5 %
Caustic soda lye 77° Tw.	3 — 5%	3 — 4 %
<u>For medium shades:</u>		
Dyestuff	2 — 4%	1.6— 3 %
Hydrosulphite conc. Powder	6 —12%	5 — 9 %
Caustic soda lye 77° Tw.	5 —10%	4 — 6 %
<u>For deep shades:</u>		
Dyestuff	4 — 6%	3 — 4.4%
Hydrosulphite conc. Powder	12 —18%	9 —14 %
Caustic soda lye 77° Tw.	10 —15%	6 — 8 %

Hydron Blue G and R Paste 20%.

<u>For light shades:</u>	Starting bath:	Subsequent lots:
Dyestuff	3 —10%	3 — 8 %
Hydrosulphite conc. Powder	3 — 6%	3 — 5 %
Caustic soda lye 77° Tw.	3 — 5%	3 — 4 %
<u>For medium shades:</u>		
Dyestuff	10 —20%	8 —15 %
Hydrosulphite conc. Powder	6 —12%	5 — 9 %
Caustic soda lye 77° Tw.	5 —10%	4 — 6 %
<u>For deep shades:</u>		
Dyestuff	20 —30%	15 —22 %
Hydrosulphite conc. Powder	12 —18%	9 —14 %
Caustic soda lye 77° Tw.	10 —15%	6 — 8 %

Hydron Blue Powder is mixed with dilute methylated spirits as indicated on page 4 and added to the bath of about 60° C. (140° F.) through a fine sieve. The paste products mixed with water are added straight to the dyebath. The caustic soda lye is then added and hereafter the hydrosulphite, for preference dissolved in cold water. The liquor is then stirred until yellow.

Goods difficult to penetrate are best dyed with the addition of 3—5 oz Turkey-red oil or Monosolvol per 10 gallons liquor.

The dyebath and the goods must appear entirely yellow during the dyeing. If the selvages begin to assume a dark appearance, some hydrosulphite must be added.

The goods, after being well freed from size and prepared for dyeing, are dyed at about 60—70° C. (140—160° F.) in 8 to 10 passages in a jigger with squeezing rollers. Towards the end of the dyeing operation the temperature may to advantage be somewhat increased. The goods are then squeezed off evenly, and oxidised by a passage through the air. Hereafter they are thoroughly rinsed.

Example from Practice for Medium Blue.

100 lbs twilled goods.

50 gallons liquor.

Starting bath:

- 1½ lbs Hydron Blue G Powder or 7½ lbs Paste 20%.
- 1½ .. Hydron Blue R Powder or 7½ lbs Paste 20%.
- 9 .. Hydrosulphite conc. Powder.
- 8 .. Caustic soda lye 77° Tw.
- 1 lb Turkey-red oil or Monosolvol.

Additions for subsequent lots:

- 19 oz Hydron Blue G Powder or 6 lbs Paste 20%.
- 19 .. Hydron Blue R Powder or 6 lbs Paste 20%.
- 7½ lbs Hydrosulphite conc. Powder.
- 5 .. Caustic soda lye 77° Tw.
- 6½ oz Turkey-red oil or Monosolvol.

The goods prepared for dyeing and well freed from size are dyed at about 60—70° C. (140—160° F.). After the last passage they are squeezed off without batching and passed over several guiding rollers in order to oxidise, being then immediately and thoroughly rinsed in a second jigger standing ready for the purpose.

b) DYEING IN THE PADDING MACHINE.

The dyeing in the padding machine is done in the customary manner with the same ingredients as for dyeing in the jigger. It is well to select as large a trough as possible for the purpose. According to the shade desired, the goods are passed once or several times through the padding machine. The dyebath is replenished by adding a stronger colour solution.

Light and medium shades may likewise be produced by padding. The goods, which have previously been freed from size and then dried, are passed through the usual small padding trough, which, according to the shade desired, is charged with

3—10	oz Hydron Blue Powder or 1—3 lbs Hydron Blue	
1— 3	lbs Hydrosulphite conc. Powder	[Paste 20%
½— 1½	„ Caustic soda lye 77° Tw.	
5	oz Turkey-red oil or Monosolvol	
	per 10 gallons liquor.	

The temperature of the dye liquor is maintained at 60—80° C. (140—175° F.) in the usual manner by heating with indirect steam. The liquor is prepared in the required strength, in a vessel placed above the other, and is allowed to flow continually into the padding trough during the dyeing.

After the squeezing off, the goods pass over some guiding rollers through the air in order to oxidise, and are then rinsed thoroughly in the usual manner.

As a rule the dyeing may be completed in one passage; only for deeper shades a second passage may have to be considered.

c) DYEING IN THE CONTINUOUS DYEING MACHINE.

This method comes mainly into consideration for lighter qualities of goods. For dyeing medium blue, for instance, the bath is charged per 10 gallons liquor with

27/8—5¾	oz Hydron Blue G Powder or	
	14½—29 oz Paste 20%	
27/8—5¾	oz Hydron Blue R Powder or	
	14½—29 oz Paste 20%	
1 lb 3 oz—2 lbs 6	oz Hydrosulphite conc. Powder	
1—2	lbs Caustic soda lye 77° Tw.	
3—5	oz Turkey-red oil or Monosolvol.	

During the dyeing, the dyebath is strengthened with

0.9— 1.8%	Hydron Blue G Powder or	4.5—9% Paste 20%
0.9— 1.8%	Hydron Blue R Powder or	4.5—9% Paste 20%
5.5—11 %	Hydrosulphite conc. Powder	
4 — 7 %	Caustic soda lye 77° Tw.	
0.5— 1 %	Turkey-red oil or Monosolvol	

reckoned on the weight of the goods.

Dye in one passage at 60—70° C. (140—160° F.), then squeeze off, pass over some guiding rollers in order to oxidise, and rinse finally.

d) DYEING IN THE VAT.

The dyeing in the vat is carried out in the same manner as customary for Indigo, except that only one passage is necessary even for deep shades.

The vat is to advantage heated a little in order to accelerate the absorption of the dyestuff.

The relative proportions of caustic soda lye and hydrosulphite to the dyestuff are the same as indicated for dyeing in the jigger.

See also page 45.

AFTERTREATMENT WITH PERBORATE.

If particularly bright shades are desired, these may easily be obtained by an aftertreatment with perborate. The aftertreatment is carried out by adding $\frac{1}{2}$ —1% perborate of soda to the last rinsing bath and treating the goods therein for some time while gradually raising the bath to the boil.

COMBINATION OF DIAMINE COLOURS OR IMMEDIATE COLOURS WITH INDIGO OR HYDRON BLUE.

Combinations of this kind are dyed in accordance with the indications for cotton yarn on page 72.

IV. DYEING WITH BASIC COLOURS.

Mordanting with Tannic Acid.

For mordanting in the *jigger*, charge the bath, according to the depth of shade to be dyed, with 1—4% tannic acid, calculated on the weight of the goods, but with at least 1½—12 oz tannic acid per 10 gallons liquor. Enter the goods at 60—70° C. (140—160° F.), and give about 4—6 ends without further heating. After the mordanting, allow the goods to lie for 2 to 4 hours.

When mordanting in the *padding machine*, prepare a solution of 3 oz—1½ lbs tannic acid per 10 gallons liquor, according to the depth of the shade to be dyed; give the goods two ends in the hot liquor, batch, and allow to cool for 2 to 4 hours.

Fixing with Antimony Salts.

This may be done with tartar emetic or any of the well-known substitutes. The bath should be charged with one-third to one-half the quantity of tartar emetic as of tannic acid, and with quantities of the substitutes equivalent to the amount of antimony they contain (see page 49). The goods are given 2—4 cold passages and are then rinsed thoroughly.

Fixing with Iron Salts.

Iron salts may be used in the place of antimony salts for fixing deep shades, employing for this purpose pyrolignite of iron or nitrate of iron (ferric sulphate) of a strength of 3—4° Tw., or 5—10% copperas. After mordanting, the goods must be rinsed well.

Dyeing.

This is done as a rule in the *jigger*, less frequently in the *padding machine*, with the addition of 2—4% acetic acid or 3—5% alum. The dyestuff is added gradually, the goods being dyed cold with 4—6 passages. Only after the bath is nearly exhausted is it heated gradually to 60—70° C. (140—160° F.), in the case of Naphtindone to the boil, in order to fix the colour thoroughly and evenly. The goods are then rinsed.

Dyeing with the Addition of Tannic Acid.

Light shades produced according to this method are mostly dyed in the padding machine or also in the jigger, as follows:

For *light blue* charge the bath for instance with

$\frac{3}{8}$ — $\frac{3}{4}$ oz New Methylene Blue	} per 10 gallons liquor,
$1\frac{1}{2}$ —3 oz tannic acid	
5 — 8 oz acetic acid	

in 1—2 passages at about 30° C. (85° F.). Then, without previous rinsing, fix the colour in a cold antimony bath containing about half the quantity of antimony used as of tannin, and rinse cold.

*Bottoming with Diamine, Immedial or Hydron Colours,
and Topping with Basic Colours.*

The topping with Basic Colours is carried out in the jigger or in the padding machine as stated on page 71 for cotton yarn. The requisite dyestuff is sometimes added straight to the finishing paste in order to save one operation.

A. Topping in the Jigger or in the Padding Machine. First give the goods 1—2 passages in a cold bath acidulated previously with 2—5% acetic acid, then add the well dissolved dyestuff in several portions, and complete the dyeing in 2—4 passages more, heating the bath to 50—60° C. (120—140° F.).

B. Topping in the Finish. Add the dissolved Basic Colours to the finishing paste while boiling it, and work otherwise as customary in finishing.

V. PARANITRANILINE RED.

Paranitraniline Red is produced with *Paranitraniline C* or its ready diazo compound, *Nitrazol C* on Beta Naphtol.

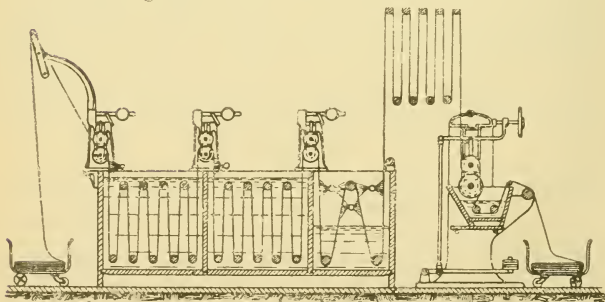
Preparing the Goods.

The pieces are best boiled and washed before dyeing, and should come to the mordanting with Beta Naphtol in a well dried state. The pieces may however be mordanted direct without being boiled previously, in which case particular attention must be paid to a good, regular impregnation in the mordanting.

Mordanting with Beta Naphtol.

In a suitable vessel (barrel or bucket)

- | | |
|--------------|------------------------------------|
| 4½ lbs | Beta Naphtol and |
| 6½ oz | Red Developer C or |
| 4 lbs 14½ oz | Beta Naphtol RC are stirred |
| | with |
| 5 lbs | caustic soda lye of 75° Tw.; |
| 7½ lbs | boiling water and subsequently |
| 6½ lbs | cold water are added, |
| | then |
| 10 lbs | castor-oil soap* dissolved in |
| 5 gallons | hot water are added, and the whole |
| | is diluted with cold water to |
| 20 gallons. | |



* For details for preparing the castor-oil soap see page 74.

If a more yellowish red is desired, the addition of Red Developer is omitted, without otherwise altering this recipe.

The impregnation of the fabrics with the Beta Naphtol solution is best done in the padding machine. The trough is filled with the solution of Beta Naphtol, which is replenished in proportion to the quantity absorbed by the pieces.

After impregnating the pieces, they are immediately dried, to best advantage in the hot-flue.

The pieces should be developed as soon as possible after the preparing and drying.

Developing.

The developing of the pieces impregnated with the Beta Naphtol solution and then dried is carried out in a padding machine of a construction similar to that shown in the sketch on the previous page.

a) Developing with Paranitraniline C.

Liquor A	{	2	lbs 13 oz	Paranitraniline C are mixed
				with
		2	gallons	boiling water and perfectly dis-
				solved by the addition of
		4½	pints	hydrochloric acid 36° Tw.
				This solution is stirred into
		about 5	gallons	cold water, cooled off to
				10—14° C. (50—60° F.) by
				adding
		about 10	lbs	ice. Then
1	gallon	4½ pints solution of nitrite		
		1:10 are added, the clear		
		solution obtained after a		
		few minutes being diluted		
		with cold water to		
		15 gallons.		

In another vessel.

Liquor B	{	6	lbs	acetate of soda are dissolved in
		4	gallons	water and diluted with water to
		5	gallons.	

For developing,

3 parts of Liquor A and
1 part of Liquor B

are used.

b) Developing with Nitrazol C.

Liquor A	{	16 lbs	Nitrazol C are dissolved at
			ordinary temperature in
		5 gallons	water and brought up with
		water to	
		15 gallons.	

In a second vessel,

Liquor B	{	1 quart	caustic soda lye of 77° Tw. is
			diluted with
		2 gallons	water; this solution is then
			mixed with
		6 lbs	acetate of soda, dissolved in
		2 gallons	water, and brought up with
		water to	
		5 gallons.	

In this case also,

3 parts of Liquor A and
1 part of Liquor B

are used.

The trough of the machine is filled with the developing liquor, the temperature of which should not exceed 14° C. (57° F.), and while passing the pieces through, fresh solution corresponding to the quantities used up (3 parts A and 1 part B) is added.

After passing through the developing liquor and well pressing between the squeezing rollers, the pieces are taken over guiding rollers through the air for several yards to give the colour time to develop completely.

The goods are finally passed through several washing boxes, then soaped boiling hot, and rinsed well.

Note. The diazo solution when ready and mixed with acetate of soda must not redden methyl orange paper; if it does, some acetate of soda or dilute caustic soda lye must be carefully added.

VI. DYEING WITH ACID COLOURS.

For dyeing with Acid Colours, the padding machine is used exclusively.

BRILLIANT CROCEINE AND SCARLET.

These dyestuffs are applied according to two different methods, viz:

a) Direct Dyeing.

Charge the padding machine with a liquor containing in addition to the requisite quantity of dyestuff (1—3 lbs per 10 gallons liquor)

8 oz alum	} per 10 gallons liquor;
8 oz desiccated Glauber's salt	
1 lb dextrine	

pass the dry goods through twice at a temperature of 60° C. (140° F.), and dry without rinsing.

b) Dyeing on Previously Mordanted Goods.

The goods are mordanted cold in the padding machine with 2—4 passages in a solution of

2½—3 lbs stannate of soda per 10 gallons liquor, then fixed without rinsing in a second bath of neutralised alum, obtained by dissolving

2 lbs alum and	} per 10 gallons liquor.
5 oz soda crystals	

The mordanted goods are given 2—4 passages in the fixing bath, and are then dyed in a fresh liquor with the requisite quantity of dyestuff at 60—70° C. (140—160° F.) without any other ingredients.

EOSINES.

a) Direct Dyeing.

Dye in the padding machine with 2—4 passages in a lukewarm liquor charged in addition to the requisite dyestuff with

3 lbs common salt and	} per 10 gallons liquor.
1 lb dextrine	

After dyeing, dry without rinsing.

b) Dyeing on Previously Mordanted Goods.

The goods are impregnated lukewarm with a 10% solution of Turkey-red oil, dried, and then fixed with a cold solution of acetate of alumina of 4^o Tw., and rinsed.

The dyeing takes place with the requisite quantity of dyestuff without any further addition, either cold or at 30—40^o C. (85—105^o F.) at the outside. The goods are sometimes mordanted beforehand with Turkey-red oil alone and dried; in such cases the dyeing is carried out with the addition of 3—4 lbs common salt per 10 gallons dye liquor.

IRISAMINE AND ROSAZEINE.

These are either dyed according to the same method as the Eosines (see previous page) or like the Basic Colours on a tannin and antimony mordant.

WATER BLUE AND INDULINES.

The dyeing may be carried out according to either of two methods, viz:

a) Direct Dyeing.

The method is exactly the same as indicated for Scarlet (page 253).

b) Dyeing on Previously Mordanted Goods.

The goods are mordanted beforehand with tannin and antimony as indicated for Basic Colours (page 248), and dyed lukewarm with the requisite quantity of dyestuff and the addition of 5—10% alum reckoned on the weight of the goods.

ISAMINE BLUE.

The dyeing may take place either in the jigger, padding machine or vat; it is carried out hot with the addition of

1 —2 lbs desicc. Glauber's salt or common salt	per 10 gallons liquor
1½—4½ oz acetic acid of 8 ^o Tw.	

according to the depth of shade required, and the requisite quantity of dyestuff. If the goods are to be rinsed after dyeing, a little acetic acid is added to the cold rinsing bath.

DYEING OF MERCERISED FABRICS.

For particulars regarding Mercerising see page 212.

Mercerised fabrics as a rule are dyed in just the same manner and in the same kinds of machines as unmercerised goods. In view of the fact that mercerised fabrics absorb the dyestuffs much more quickly than unmercerised, the additions of salt in the case both of Diamine and Immedial Colours should be correspondingly reduced. In a like manner mercerised materials require 20—25% less dyestuff than is necessary for unmercerised material.

DYEING WITH DIAMINE COLOURS.

Charge the *jigger* for *light shades* with

$\frac{3}{4}$ — $1\frac{1}{2}$ oz soda ash
 3— $4\frac{1}{2}$ oz Turkey-red oil or Monosolvol
 per 10 gallons liquor.

First give the goods two passages at about 40° C. (105° F.), then add the requisite quantity of dyestuff in several portions, and raise the temperature gradually to about 80° C. (175° F.).

Medium and deep shades are dyed in the *jigger* with the addition of

$1\frac{1}{2}$ —3 oz soda ash,
 3 — $4\frac{1}{2}$ oz Turkey-red oil or Monosolvol
 1 — $1\frac{1}{2}$ lbs Glauber's salt cryst.
 per 10 gallons liquor

and the requisite dyestuff.

Commence dyeing at about 50° C. (120° F.), and give four passages, only then adding the Glauber's salt in two portions. and raise the temperature gradually to boiling point.

When dyeing in the *vat* or in the *continuous dyeing machine*, the procedure is the same as described on pages 216 and 217, except that the quantity of Glauber's salt is reduced to about one-half of that indicated there.

The diazotising and developing, aftertreatment with metallic salts. etc., are the same for mercerised as for

unmercerised goods, but in this case also the quantities are reduced by about 20%.

DYEING WITH IMMEDIAL COLOURS.

The Immedial Colours are as a rule dyed in the jigger or padding machine exactly in accordance with the general directions on page 224 et seq.; the quantity of salt should either be reduced or omitted altogether as the case may be, and that of sodium sulphide somewhat increased.

Example:

Black dyed with Immedial Black on Umbrella Cloth.

6 pieces of mercerised satteen. 80 lbs. in 30 gallons liquor.

Starting bath:

9½	lbs	Immedial Black NNG conc.
14¼	„	sodium sulphide crystals
1½	„	soda ash
1	lb	Turkey-red oil or Monosolvol.

For subsequent lots:

4¾	lbs	Immedial Black NNG conc.
4¾	„	sodium sulphide crystals
6	oz	soda ash
4	„	Turkey-red oil or Monosolvol.

The method of working is the same as indicated on page 224.

Particularly clear, bright blacks are obtained by adding some dextrine or glue. The two products are frequently used together, the starting bath in such case being charged with abt. $\frac{2}{3}$ dextrine and $\frac{1}{3}$ glue of the weight of the dyestuff. When dyeing subsequent lots, $\frac{1}{2}$ to 1% dextrine and glue of the weight of the goods is sufficient.

DYEING WITH HYDRON COLOURS.

The method of working is the same as indicated on page 244 for ordinary piece-goods, the ingredients also being the same; the only difference is that the quantities of dyestuff etc. are reduced by about a quarter to one-fifth, the quantity of hydrosulphite on the other hand being increased if anything. besides which some Turkey-red oil or Monosolvol are added to the dye-liquor.

DYEING WITH BASIC COLOURS.

The mordanting baths described on page 248 are charged with only about two-thirds of the ingredients there mentioned.

Some care is required in the dyeing to ensure level dyeing and thorough penetration. The dyebath should therefore be kept rather dilute and charged with 3—5% acetic acid, the dyestuff solution being added in 3—4 portions. The dyeing is commenced cold, the bath being heated only when fairly exhausted.

Very light shades may also be dyed in a lukewarm soap bath.

Simplest method of production

All the Oxy Diamine Black or Para Diamine Black brands in light shades, viz:

For bluish greys:

Para Diamine Black B, BB,
FFB, *FFD, *FF
Oxy Diamine Black A, SA,
*FFC, JW, JWF
*Diamine Black BH, BHN.

For greenish greys:

Oxy Diamine Black JE, JEL,
JB, D, AT, UI, US

For reddish greys:

Oxy Diamine Black RR, AM, NR

The following are used for shading:

*Oxy Diamine Brown G, 3GN,
*Diamine Fast Yellow B [RN
Oxy Diamine Violet B, R, G.

The concentrated brands of Oxy Diamine Black and Para Diamine Black have the same properties as the above named products, but considerably greater tinctorial power.

Of better fastness to light

*Diamine Fast Grey BN, RN
*Diamine Grey G

Diamine Jet Black *SS, *Cr,
RB, OO

*Diamine Dark Blue B

*Diaminogene extra

*Diamine Fast Black F,
C high conc., CB high conc.

*Diamine Fast Blue FFB, FFG
shaded with

Diamine Fast Brown G, R

Diamine Fast Orange ER

*Diamine Fast Yellow B.

Combinations of

*Diamine Dark Blue B

*Diamine Catechine B

*Diamine Fast Yellow B

used particularly for mercerised materials, velveteens, moleskins, etc.;

further, combinations of

Diamine Fast Blue FFB

Diamine Fast Orange ER

Diamine Fast Yellow B,

which yield the direct greys fastest to light.

These dyestuffs are used

ON COTTON FABRICS.

Of good fastness to washing
and light

Diamine Jet Black } after-
*SS, *Cr, RB, } treated
OO } with
bichrome

*Diamineral Black } after-
B, 3B, 6B } treated
*Diamine Fast Black } with bi-
F } chrome and
sulphate of
copper

shaded with

*Diamine Orange B
*Diamine Fast Yellow B, FF,
Diamineral Brown G. [A

*Diamine Fast Black } after-
C high conc., } treated
CB high conc. } with
formal-
dehyde
and
bichrome.

Exceedingly fast to washing
and light

For Grey with a blue cast:

*Immedial Black V extra, FF extra
*Immedial Brilliant Black B,
5BV conc., 6BG conc.
*Immedial Brilliant Carbon
F, FG.

For greenish Greys:

*Immedial Black G extra, NG,
NNG conc.
*Immedial Brilliant Black
6BG conc., 8BG conc.
*Immedial Carbon B.

For reddish Greys:

*Immedial Black NF, NR, NRT,
NN conc., NLN conc., NNR conc.
*Immedial Carbon R, JHJ.

The following are used for shading:

*Immedial Cutch O, G, R
*Immedial Dark Brown D conc.,
*Immedial Red Brown 3R [DS
*Immedial Yellow Olive G, 5G
*Immedial Deep Green G
*Immedial Direct Blue B.

For directions for dyeing see pages
25 and 26.

The fastness to light and storing
may be still further enhanced by an
aftertreatment with bichrome and
copper sulphate.

These products are used for upholstery and tapestry materials
as well as for dress goods etc. where the requirements for fastness
to light and washing are very exacting.

also for mercerised goods.

possess good fastness to hot pressing.

DYESTUFFS FOR MODE SHADES

Simplest method of production	Of better fastness to light
<p>Combinations of</p> <p>*Diamine Fast Yellow B</p> <p>*Oxy Diamine Yellow GG, TZ</p> <p>*Oxy Diamine Orange G, R</p> <p>*Oxy Diamine Brown G, 3GN, RN</p> <p>shaded with</p> <p>Oxy Diamine Black JEI, JB,</p> <p>*Diamine Black BH [JW]</p> <p>Oxy Diamine Violet B, R, G.</p>	<p>Combinations of</p> <p>*Diamine Fast Yellow B, FF</p> <p>*Diamine Orange G</p> <p>Diamine Fast Orange ER, EG</p> <p>*Diamine Catechine B</p> <p>Diamine Fast Brown G, R</p> <p>*Diamine Fast Blue FFB, FFG</p> <p>*Diamine Fast Brilliant Blue R</p> <p>*Diaminogene extra</p> <p>*Diamine Rose BD, GD</p> <p>or</p> <div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>*Diamine Dark Blue B</p> <p>*Diamine Blue RW</p> <p>*Diamine Sky Blue FF</p> <p>*Diamine Bengal Blue G</p> <p>*Diamineral Blue R</p> <p>Diamineral Brown G</p> <p>*Diamine Orange B</p> <p>*Diamine Fast Yellow B</p> <p>*Diamine Catechine</p> <p style="text-align: right;">B, 3G</p> </div> <div style="flex: 0.2; font-size: 3em; line-height: 1; padding: 0 10px;">}</div> <div style="flex: 0.8; writing-mode: vertical-rl; transform: rotate(180deg); font-size: 0.8em;"> aftertreated with sulphate of copper. </div> </div> <p>For mercerised materials, the following combination is generally preferred, and may serve as a basis for all mode shades:</p> <p>*Diamine Dark Blue B or</p> <p>*Diaminogene extra with</p> <p>*Diamine Catechine B</p> <p>*Diamine Fast Yellow B,</p> <p>or of better fastness to light:</p> <p>*Diamine Fast Blue FFB or</p> <p>*Diamine Fast Brilliant Blue R</p> <p>with</p> <p>Diamine Fast Orange ER</p> <p>*Diamine Fast Yellow B.</p>
	<p style="text-align: right;">These dyestuffs are used</p>

ON COTTON FABRICS.

Of good fastness to washing
and light

Exceedingly fast to washing
and of good fastness to light

Combinations of

- *Diamine Fast Yellow
A, B, FF
- *Diamine Orange B
- Diamineral Brown G
- Diamine Brown
*3G, M
- Diamine Catechine
*B, 3G, *G
- *Diamineral Blue
BF, R
- *Diamine Fast Black F
- *Diamine Fast Grey
BN
- *Diamineral Black
B, 3B, 6B

aftertreated with copper sulphate
and bichrome.

- *Immedial Yellow Olive G, 5G
- *Immedial Cutch G, BG, BGG,
O, R
- *Immedial Brown B, BR, BRS,
RR, W conc.
- *Immedial Dark Brown A
- *Immedial Red Brown 3R
- *Immedial Dark Brown D conc.,
- *Immedial Bronze A [DS
- *Immedial Khaki D, G
shaded with
- *Immedial Orange C
- *Immedial Yellow D, GG
saddened with
- *Immedial Black NRT,
NNG conc.
- *Immedial Carbon B
or
- *Immedial Dark Green B.

Immedial Yellow Olive G or 5G are recommended as the best basis for all mode shades. They level best and can be shaded with any of the above-named dyestuffs.

When the requirements are exacting with regard to fastness to light as in the case of khaki shades, the dyeings should be aftertreated with bichrome and copper sulphate. This treatment also increases the fastness to string.

also for mercerised goods.

possess good fastness to hot pressing.

DYESTUFFS FOR BROWN

Simplest method of production

Of good fastness to light

*Cotton Brown A, N
 Cotton Dark Brown BM, BB
 *Diamine Brown 31, 32, 33, 38,
 39, 40
 Diamine Brown 30a, 34—37,
 41—45
 *Diamine Brown 5G
 *Oxy Diamine Brown G, 3GN, RN
 *Diamine Nitrazol Brown RD,
 BD, T
 shaded with
 *Oxy Diamine Orange G, R
 *Oxy Diamine Yellow GG, TZ
 *Diamine Fast Yellow B
 Oxy Diamine Violet B, R, G
 saddened with
 Oxy Diamine Black JEL, JW, JB
 *Diamine Black BH
 or,
 with better fastness to light:
 Diamine Brown MR, B, R, 3G*
 Diamineral Brown G
 *Diamine Catechine B, G, 3G
 shaded with
 *Diamine Orange G, D
 *Diamine Fast Yellow B
 *Diamine Dark Blue B.

Diamine Fast Brown G,
 R, *GB
 Diamine Fast Orange EG, ER
 saddened with
 *Diamine Fast Blue FFB, FFG
 or
 *Diamine Brown 3G
 Diamineral Brown G
 Diamine Catechine
 *B, *G, 3G
 Diamine Brown M, B
 shaded with
 *Diamine Fast Yellow
 B, FF
 *Diamine Orange B
 saddened with
 *Diamineral Blue BF, R
 *Diamine Dark Blue B

aftertreated with copper sulphate.

These dyestuffs are used

ON COTTON FABRICS.

Of very good fastness to washing

- *Diamine Nitrazol Brown
G, GF, RD, BD, B, T
- *Oxy Diamine Brown
G, RN
- Diamine Brown S, MR
shaded with
- *Diamine Nitrazol
Orange R
- *Diamine Nitrazol
Bordeaux GB
- *Diamine Fast Yellow A
- *Primuline
saddened with
- Oxy Diamine Black A,
JEL, JW
- *Diamine Nitrazol Black
B

coupled
with
Nitrazol
C.

Possessing at the same time very
good fastness to light:

- *Diamine Brown 3G
- Diamineral Brown G
- Diamine Catechine
*B, *G, 3G
- Diamine Brown B, M
shaded with
- *Diamine Fast Yellow
B, A, FF
- *Diamine Orange B
saddened with
- *Diamineral Blue R,
BF, CV
- *Diamine Fast Black F

after-
treated
with bi-
chrome
and sul-
phate of
copper.

Exceedingly fast to washing
and of good fastness to light

- *Immedial Cutch O, G, R,
BG, BGG
- *Immedial Brown B, BR,
BRS, RR, W conc.
- *Immedial Dark Brown
D conc., DS
- *Immedial Red Brown 3R
- *Immedial Dark Brown A
- *Immedial Yellow Brown EN
- *Immedial Prune S
- *Immedial Maroon B conc.

The following are used for
shading:

- *Immedial Bordeaux G conc.,
GF conc.
- *Immedial Khaki G and D
- *Immedial Orange C
- *Immedial Yellow Olive G, 5G
- *Immedial Dark Green B
- *Immedial Olive B, 2G, 3G;

and for saddening:

- *Immedial Black
- *Immedial Carbon B { all
brands.

Dyed according to the direct-
ions on page 33 and 34.

By an aftertreatment with
bichrome and copper sulphate, the
fastness to light and to storing is
still further enhanced.

The dyeings are frequently
topped with Basic Colours such as
Safranine, Tannin Orange, Chry-
soidine. Bismarck Brown, etc.

also for mercerised goods.

possess good fastness to hot pressing.

DYESTUFFS FOR YELLOW AND ORANGE

Simplest method of production

Of good fastness to light

For greenish Yellows:

- *Thioflavine S
- *Oxy Diamine Yellow GG,
TZ, CR.

For full shades of Yellow and Orange:

- *Diamine Fast Yellow B, FF,
M, A, AR, AGG
- *Diamine Yellow CP, CPO,
CPI, CPII, N
- *Diamine Orange G, D, F, B
- *Oxy Diamine Orange G,
R, RN.

The following are used for shading towards red:

- *Diamine Fast Scarlet GFF
- *Diamine Brilliant Scarlet S.

For greenish Yellows:

- *Diamine Fast Yellow 3G.

For full shades of Yellow:

- *Diamine Fast Yellow B, FF,
M, A, AR, AGG
- *Diamine Yellow CP, CPO, CPI,
CPII, N.

For Orange:

- Diamine Fast Orange EG, ER
- *Diamine Orange G, D
- *Diamine Gold
- *Diamine Orange B, aftertreated
with sulphate of copper
shaded towards red with
- *Diamine Rose GD, BD.

The same dyestuffs are used for cream shades.

Diamine Fast Yellow 3G, Diamine Yellow CP and N, and Oxy Diamine Yellow CR are preferred for discharge styles, being the most easily dischargeable brands.

These dyestuffs are used

ON COTTON FABRICS.

Of very good fastness to washing

Exceedingly fast to washing

*Diamine Yellow N shaded with	} aftertreated with chrome salts.
*Diamine Fast Red F	
*Diamine Orange B	} aftertreated with copper sulphate
*Diamine Fast Yellow 3G	
*Diamine Nitrazol Orange R, coupled with Nitrazol C.	
*Thioflavine T, TCN	} on a tannin- antimony mordant
*Paraphosphine GG, G, R	
*Tannin Orange R shaded with	
*Irisamine G	
*Rosazeïne 6G	
*Safranine, all brands	

*Immedial Yellow GG, D
*Immedial Orange C.

Dyed according to the directions on page 32.

If greater fastness to light be required, the above named dye-stuffs should be aftertreated with bichrome and copper sulphate, whereby the fastness to storing is also still further increased.

also for mercerised goods.

possess good fastness to hot pressing.

DYESTUFFS FOR PINK AND RED

Simplest method of production

Of better fastness to light

Diamine Red 4B, *5B, *6B,
 *10B, *D, *DN
 *Diamine Purpurine B, 3B, 6B, V
 *Diamine Brilliant Scarlet S
 Diamine Scarlet 3B
 *Direct Rose T
 *Diamine Fast Scarlet 8BN
 *Diamine Brilliant Rubine S
 *Diamine Fast Red F
 *Diamine Fast Scarlet GG, GFF,
 4BFS, 4BFF, 5BFF,
 7BFF, 8BF, 10BF.

*Diamine Rose B extra, BD,
 BG, GD, FFB
 *Diamine Fast Red 8BL
 *Irisamine G
 *Rosazeïne 6G
 *Safranine, all brands
 } on a tannin-
 anti-
 mony
 mordant
 *Diamine Fast Scarlet
 GG, GFF, 4BFS,
 4BFF, 5BFF, 7BFF
 *Diamine Brilliant
 Rubine S
 } after-
 treated
 with
 sulphate
 of
 copper

Very bright shades of Pink not fast to washing:

*Eosine
 *Erythrosine
 *Phloxine,
 } all brands.
 *Rosazeïne 6G, B
 *Irisamine G
 } on a Turkey-red
 oil mordant.

Very bright shades of Pink not fast to washing:

*Brilliant Croceïne, all brands
 *Scarlet FR, F2R, F3R.

These dyestuffs are used

ON COTTON FABRICS.

Of very good fastness to washing

- | | |
|---|--|
| *Primuline | } diazo-
tised and
deve-
loped
with
Beta
Naphtol |
| *Diamine Azo Scarlet
4B, 8B, A, B | |
| *Diamine Azo
Bordeaux B | |
| *Diamine Nitrazol Scarlet A,
coupled with Nitrazol C | |
| *Diamine Fast Red F, after-
treated with chromium fluoride | |
| *Irisamine G | } on a
tannin-
anti-
mony
mordant |
| *Rosazine 6G | |
| *Safranine, all brands
shaded with | |
| *Thioflavine T | |
| *Tannin Orange R | |

Of very good fastness to washing
and light:

- *Paranitraniline Red;
see directions on page 250.

Fast to acids

Resisting organic acids:

- | | |
|---|--|
| *Diamine Rose, all brands | } developed
with
Beta
Naphtol |
| *Direct Rose T | |
| *Diamine Brilliant Scarlet S
Diamine Scarlet 3B | |
| *Diamine Fast Scarlet GG, GFF,
4BFS, 4BFF, 5BFF, 7BFF,
8BF, 8BN, 10BF | |
| *Diamine Brilliant Rubine S | |
| *Diamine Fast Red F | } |
| *Diamine Fast Red 8BL | |
| *Diamine Purpurine, all brands | |
| *Diamine Brilliant Bordeaux R | |
| *Diamine Fast Bordeaux 6BS | |
| *Primuline | } developed
with
Beta
Naphtol |
| *Diamine Azo Scarlet
4B, 8B, A, B | |
| *Diamine Azo Bordeaux
B | |
| *Paranitraniline Red. | |

Resisting dilute mineral acids:

- | | |
|---|--|
| *Diamine Rose, all brands | } developed
with
Beta
Naphtol |
| *Direct Rose T | |
| *Diamine Brilliant Scarlet S | |
| *Diamine Fast Scarlet GG,
GFF, 4BFS, 4BFF, 5BFF,
7BFF, 8BF, 8BN, 10BF | |
| *Diamine Fast Red 8BL | |
| *Diamine Brilliant Rubine S | } developed
with
Beta
Naphtol |
| *Primuline | |
| *Diamine Azo Scarlet
4B, 8B, A, B | |
| *Diamine Azo Bordeaux
B | |
| *Paranitraniline Red. | |

also for mercerised goods.

possess good fastness to hot pressing.

DYESTUFFS FOR VIOLET AND CLARET

**Simplest method of production
and normal fastness**

Of better fastness to light

Violet:

*Diamine Violet N, BB, RB
Diamine Brilliant Violet
B, RR
Oxy Diamine Violet B, R,
G, BF
Diamine Heliotrope B, G, O.

Claret:

Diamine Bordeaux *B, S,
*BR, VRO
*Diamine Brilliant Bordeaux
R
*Diamine Brilliant Rubine S
*Diamine Violet Red.

The following products serve for
shading or saddening:

Diamine Red 4B, *10B
*Oxy Diamine Orange G, R
Oxy Diamine Blue 3R
*Diamine Black BH.

The shades are frequently topped
for brightening with Basic Colours
such as

*Methyl Violet, all brands
*Tannin Heliotrope
*Safranine, all brands
*Magenta.

Violet:

Diamine Fast Violet FFBN,
FFRN
or

*Diamine Fast Violet FFBN	} after- treated with copper sulphate.
shaded with	
*Diamine Blue 3R	
*Diamine Brilliant Blue G	
*Diamine Brilliant Rubine S	

Claret:

Diamine Fast Bordeaux 6BS
*Diamine Bordeaux B, BR
*Diamine Brilliant Bordeaux R
shaded with

*Diamine Fast Red F
*Diamine Fast Red 8BL
*Diamine Violet N, BB

*Diamine Brilliant Rubine S	} after- treated with copper sulphate.
shaded with	
Diamine Fast Orange EG, ER	
*Diamine Fast Violet FFBN	

The brightest shades of Violet and
Claret are produced with

*Tannin Heliotrope	} on a tannin- antimony mordant
*Safranine	
shaded with	
*New Methylene Blue N	
*Para Phosphine R	

These dyestuffs are used

ON COTTON FABRICS.

Of very good fastness to washing

Exceedingly fast to washing

*Diamine Azo Bordeaux B,
diazotised and developed with Beta
Naphtol

*Primuline	} diazotised and deve- loped with Beta Naphtol or Bordeaux Developer
shaded with	
*Diamine Black BH	
Diamine Azo Blue RR	

*Diamine Nitrazol Bordeaux GB,
coupled with Nitrazol C.

For brightening, the dyeings are
frequently topped with Basic Colours.

Very bright shades are obtained with

*Methyl Violet,	} on a tannin- anti- mony mordant
all brands	
*New Methylene Blue	
3R	

*Tannin Heliotrope
*Safranine, all brands

also for mercerised goods.

Violet:

*Immedial Indone Violet
B conc.
*Immedial Violet C, CB, CR
*Immedial Prune S
*Immedial Purple C, after-
treated with sulphate of copper.

Claret:

*Immedial Maroon B conc.
*Immedial Bordeaux G conc.,
GF conc.
*Immedial Purple C,
died direct
*Immedial Red Brown 3R.

Dyed according to the directions
on page 34.

For brightening purposes, the
dyeings are frequently topped with
Basic Colours.

The following of the above-
named products are also of very
good fastness to light:

*Immedial Indone Violet
B conc.
*Immedial Maroon B conc.
*Immedial Bordeaux G conc.,
GF conc.

and further:

*Immedial Purple C, after-
treated with sulphate of copper.

DYESTUFFS FOR BLUE AND DARK BLUE

Simplest method of production

Of very good fastness to light

For light and brilliant Blues:

- *Diamine Sky Blue, FF, FFN
- *Diamine Pure Blue A
- *Diamine Blue 2B, 3B, RW
- Diamine Brilliant Blue G
- Oxy Diamine Blue 5G, 3G.

For medium and deep shades of Blue:

- Diamine Blue BX, BG, NC, 3R, AZ, 50, 52, 52a, 53, 53a, 55, *56
- *Diamine Steel Blue L
- Diamine Bengal Blue R, *G
- Diamine Brilliant Blue G
- Diamineral Blue *R, *B, *BF, *3B, CV, CVB, 3RC
- *Diamine Deep Blue B, R
- Oxy Diamine Blue G, B, R, 3R
- Diamine Azo Blue R, RR, No 51, *54
- *Diamine Dark Blue B
- *Diamine Black BH.

The following are used for saddening:

- Oxy Diamine Violet B, R, G
- Oxy Diamine Black A, JW, JE.

For cheap Navies:

- *Diamine Black BH
- *Diamineral Blue R

topped
with Naph-
tindone BB

For very bright Blues requiring no special fastness to washing:

- Isamine Blue 8B, 6B, B, R,
- dyed according to the directions on page 254.

- *Methyl Blue for Cotton
- *Pure Soluble Blue
- *Water Blue B, RB, R
- *Blue JBP, JB, BS, FS, RS, RRS
- *Alkaline Blue 3R to 6R

dyed direct
with the
addition of
alum and
Glauber's
salt

- *Diamine Fast Blue G, FFG, FFB, BN
- *Diamine Fast Brilliant Blue R
- *Diamine Sky Blue FF, FFN, FFS
- *Diamine Blue RW
- *Diamine Brilliant Blue G
- *Diamine New Blue R
- *Diamine Blue 3R
- *Diamineral Blue *R, *B, *BF, *3B, CV, CVB, 3RC
- *Diamine Deep Blue R, B
- *Diamine Dark Blue B
- *Oxy Diamine Blue 5G, 3G, G, R
- *Diamine Bengal Blue G, R

aftertreated with copper sulphate.

Of very good fastness to washing:

- *Diamine Black BH
- Diamine Azo Blue R, 2R, 6B

devel-
oped
with
Beta
Naphtol

Shading and brightening may

These dyestuffs are used

ON COTTON FABRICS.

Of very good fastness to washing and light

Of excellent fastness to washing and light

*Diamine Sky Blue
FF, FFN, FFS
*Diamine Blue RW
*Diamine Brilliant
Blue G
*Diamine New Blue R
Diamineral Blue *R,
*B, *BF, *3B, CV,
CVB, 3RC
*Diamine Dark Blue B
*Diamine Bengal Blue
G, R

aftertreated with copper sulphate

*Diaminogene Sky
Blue N
*Diaminogene Blue
G, BB, NB, NA,
2RN, 3RN, 6RN
Diamine Heliotrope
B, O, G
*Diaminogene Dark
Blue

developed with Beta Naphtol

*New Methylene Blue
*Methylindone
*Indazine
*Metaphenylene Blue
*Naphtindone

all brands
on a tannin-
antimony
mordant

*Immedial Indone 4B conc.,
3B conc., BBF conc., BF conc.,
JBF conc., JBN conc., BN conc.,
R conc., RR conc., RG conc.,
RB conc.

*Immedial Indogene BCL conc.,
GCL conc., RCL conc., RRCL
conc., B conc.

*Immedial Direct Blue B, R, JB,
OD, BB extra conc., 4B extra
conc., JND extra conc., FCL
extra conc.

*Immedial Dark Blue CRV, J

*Immedial Blue C, CB, CR,
single strength and
concentrated brands

*Immedial New Blue
G conc.

died direct
or developed.

The following products are used
for shading:

*Immedial Green Blue CV
*Immedial Deep Green G
*Immedial Indone Violet B conc.
*Immedial Brilliant Carbon F,
*Immedial Carbon B. [FG]

See dyeing directions on pages
27—31.

The excellent fastness to washing
and light may be still further enhanced
by an aftertreatment with bichrome
and copper sulphate.

Best fastness to washing and light together with excellent fastness to
chloring and bleaching:

*Hydron Blue G powder and paste } dyeing directions
*Hydron Blue R powder and paste } on page 244.

be carried out at will by topping with Basic Colours.
also for mercerised goods.

possess good fastness to hot pressing.

DYESTUFFS FOR GREEN AND OLIVE

Simplest method of production

Of very good fastness to light

For medium and dark Greens:

- *Diamine Green B, G, CL,
FG, BO, BZ, NA
- *Diamine Dark Green N
shaded with
- *Diamine Fast Yellow B, FF
- *Diamine Yellow CP
- *Oxy Diamine Yellow GG, TZ
- *Oxy Diamine Orange G, R
saddened with
- *Diamine Black BH, HW
- Oxy Diamine Black JEI, JB.

For brighter shades of Green.

Combinations of

- *Diamine Sky Blue, FF,
FFN, FFS
- *Diamine Pure Blue A
- Oxy Diamine Blue 5G, 3G
with
- *Thioflavine S
- *Oxy Diamine Yellow GG, TZ
- *Diamine Fast Yellow FF,
AGG.

For full shades of Green

and Olive:

- *Diamine Dark Green N
- Diamine Bronze G
shaded with
- *Diamine Fast Yellow B,
FF, A, AR, AGG
- *Oxy Diamine Orange G, R
- *Oxy Diamine Brown G, 3GN
saddened with
- Oxy Diamine Black JEI
- *Diamine Black BH.

For light Greens:

- *Diamine Sky Blue
FF, FFN, FFS
- *Oxy Diamine Blue 3G, 5G
in combination with
- *Diamine Fast Yellow
FF, 3G*)

after-
treated
with
copper
sulphate

For more covered shades of Green

and Olive:

Combinations of

- *Diamine Fast Brilliant Blue R
- *Diamine Fast Blue FFB, FFG, G
- *Diamine Fast Yellow B, FF
- *Diamine Yellow CP
- Diamine Fast Orange EG, ER
- Diamine Fast Brown G, R

or,

Combinations of

- *Diamine Sky Blue
FF, FFN, FFS
- *Diamine Blue RW
- *Diamine Bengal Blue G
- *Diamineral Blue R, BF
- *Diamine Fast Yellow
B, FF
- *Diamine Orange B
- Diamineral Brown G

after-
treated
with
copper
sulphate.

*) Diamine Fast Yellow 3G is best dyed in soft water with the addition of soap and phosphate of soda.

For brightening, the dyeings are

These dyestuffs are used

ON COTTON FABRICS.

Of very good fastness to washing

Exceedingly fast to washing
and light

For Green:

- | | |
|-------------------|--|
| *Diamine Green G | } after-treated with chromium fluoride |
| shaded with | |
| *Diamine Yellow N | |

Of very good fastness to washing
and light:

Combinations of

- | | |
|--------------------------------|---|
| *Diamine Sky Blue FF | } after-treated with sulphate of copper |
| FFN, FFS | |
| *Diamine Blue RW | |
| *Diamineral Blue R, B | |
| BF, 3B | |
| *Diamine Bengal Blue | |
| G, R | |
| *Diamine Dark Blue B | |
| *Diamine Fast Yellow | |
| B, FF, A, AGG | |
| *Diamine Orange B | |
| Diamineral Brown G | |
| *Diamine Nitrazol Green GF, | |
| BB, S coupled with Nitrazol C. | |

For very bright shades of Green:

- | | |
|---------------------|--------------------------------|
| *Brilliant Green | } on a tannin-antimony mordant |
| *Solid Green | |
| shaded with | |
| *Thioflavine T, TCN | |

For olive shades:

- | | |
|---------------------|--------------------------------|
| *New Methylene Blue | } on a tannin-antimony mordant |
| GG, N | |
| shaded with | |
| *Thioflavine T, TCN | |
| *Tannin Orange R | |

- *Immedial Green GG extra, BB extra, GGX conc., BBX conc., BBXN conc.
- *Immedial Brilliant Green G extra
- *Immedial Deep Green G
- *Immedial Green Blue CV
- *Immedial Dark Green B
- *Immedial Olive B, GG, 3G
- *Immedial Yellow Olive G, 5G shaded with
- *Immedial Indone 3B conc.
- *Immedial Indogene GCL conc.
- *Immedial Yellow D, GG
- *Immedial Orange C
- *Immedial Cutch G
- *Immedial Yellow Brown EN
- *Immedial Dark Brown D conc., DS saddened with
- *Immedial Direct Blue B
- *Immedial Black NG, NNG conc.
- *Immedial Carbon B.

For dyeing directions see p. 32.

The fastness to light and storing may be still further enhanced by an aftertreatment with bichrome and copper sulphate.

frequently topped with Basic Colours.
also for mercerised goods.

possess good fastness to hot pressing.

Simplest method of production

Of very good fastness to light

For Blue-black:

- *Para Diamine Black B, BB,
FFB, FF, FFD extra conc.
- *Oxy Diamine Black A, SA, FFC,
AFF, JW, JWF, JWB extra
conc., JWN extra conc.

For greenish Blacks:

- *Oxy Diamine Black JE, JEI,
JB, D, AT UI
- *Oxy Diamine Carbon JB, JEI.

For Jet Blacks:

- *Oxy Diamine Black RR, US
- *Oxy Diamine Black AM,
FFN extra conc.

For black shirting, glacé, etc.

the following brands in particular are
used:

- *Oxy Diamine Black D, AT,
FFC, FFN extra conc.
- *Para Diamine Black FF, FFB,
FFD extra conc.

For mercerised materials:

- *Oxy Diamine Black JB, JEI, JW
- *Oxy Diamine Carbon JB, JEI
- *Para Diamine Black FFB
(for Blue-blacks).

*The concentrated brands of Oxy
Diamine Black and Para Diamine
Black have the same properties as
the above named products, but con-
siderably greater tinctorial power.*

- *Diamine Fast Black F, X,
XN extra conc., C high
conc., CB high conc.
- *Diamine Jet Black OO, RB,
Cr, SS.

For mercerised materials, the
following are mainly used:

- *Diamine Fast Black F, X,
XN extra conc., C high conc.,
CB high conc.

For velveteens and corduroy, the
following are employed to a large
extent:

Dyed direct:

- *Diamine Jet Black OO, SS
- *Oxy Diamine Black S000, N,
UI

in combination with

- *Diamine Black HW.

Developed Dyeings:

- *Oxy Diaminogene
OT, OB, FFN
- *Diaminogene B
- *Diamine Black DB,
DN
- *Diamine Black BH
- shaded with
- *Diamine Black HW.

developed by the
various methods

ON COTTON FABRICS.

Of very good fastness to washing

Exceedingly fast to washing and light

a) Cheapest method of production:

*Diamine Black BH
*Diamine Azo Black
B, R

developed with Phenylene
Diamine, Phenylene
Diamine and Resorcline,
Phenylene Diamine and
Beta Naphthol, or
Beta Naphthol and Resorcline.

*Diamine Nitrazol
Black B, BB, KR, KG
*Oxy Diamine Black
A, D, JW, JEI

coupled with the
Nitrazol C with the
addition if neces-
sary of a little
New Methylene
Blue

b) Possessing at the same time

very good fastness to light:

*Diaminogene extra,
B, BR, BW, CCL
*Oxy Diaminogene
OB, OT, ED, EM,
EF, FFN, FFG
*Diamine Black
DB, DN

diazotised and deve-
loped with Phenylene
Diamine, Phenylene
Diamine and
Resorcline, or Beta
Naphthol and Resorcline

*Diamineral Black B, 3B, 6B,
aftertreated with bichrome and
copper sulphate.

Diamine Jet Black OO, *SS,
*Cr, RB, *M, aftertreated with
bichrome.

*Diamine Fast Black C and
CB high conc., aftertreated
with formaldehyde and bichrome.

For mercerised goods, the dye-
stuffs mentioned under (b) are
principally used.

Any of the Immedial Blacks, Imme-
dial Brilliant Black, Immedial Carbon,
and Immedial Brilliant Carbon.

For Blue-black:

*Immedial Black V extra
*Immedial Brilliant
Black 5BV conc.
*Immedial Brilliant
Carbon F

dyed direct or
aftertreated
with
blechrome

For Black with a blue cast:

*Immedial Black
FF extra
*Immedial Black NB,
BF conc., NBB conc.
*Immedial Brilliant
Black B, 6BG conc.
*Immedial Brilliant
Carbon FG

dyed direct or
aftertreated
with
bichrome

For Black with a green cast:

*Immedial Black G extra
*Immedial Black NG, NNG conc.
*Immedial Brilliant Black
8BG conc.
*Immedial Carbon B.

For deep covered shades of Black:

*Immedial Black NF, NR, NNZ
conc., NNR conc., NLN conc.
*Immedial Carbon R, JHJ,
BL, KBL.

For mercerised materials, the following
are used principally:

*Immedial Black FF extra,
NNG conc., NBB conc.
*Immedial Brilliant Black B,
6BG conc., 8BG conc.
*Immedial Carbon B
*Immedial Brilliant Carbon FG.

Dyed according to the directions on
pages 25 and 26.

DYEING OF COTTON FABRICS WITH WHITE OR COLOURED SILK EFFECT THREADS OR SELVEDGES.

A. DYEING WITH DIAMINE COLOURS.

The following Diamine Colours are very well suited for producing *fancy shades* on cotton fabrics containing silk effect threads; they either do not stain the silk at all or only very slightly:

Diamine Black BH	Diamine Fast Yellow
Diamine Sky Blue	A, AGG
	Diamine Orange G, D

and for light shades:

Diamineral Blue R	Diamine Fast Scarlet GG,
Damine Fast Blue FFB	GFF, 4BFF, 4BFS, 5BFF,
Diamine Catechine B	7BFF
Diamine Violet N	Diamine Brilliant Rubine S.
Diamine Nitrazol Brown G	

Dye in the jigger, padding machine or on a winch at a temperature of 40—60° C. (105—140 deg. F.) with the addition $\frac{3}{4}$ —1½ oz soda, 4½—9 oz soap and 4½—8 oz phosphate of soda per 10 gallons liquor. For medium and deep shades, 8 oz—1 lb Glauber's salt per 10 gallons liquor may be used in place of the phosphate of soda.

Blacks are usually dyed with Diamine Black BH shaded with a little Diamine Fast Yellow A, and diazotised, and developed with Phenylene Diamine, Beta Naphtol and Resorcine, as indicated on page 218.

For the diazotising and developing, it is advisable to reduce the quantities of the ingredients ordinarily used by about one-third, and to carry out the two operations as quickly as possible.

Particularly clear effects are obtained on mercerised goods.

B. DYEING WITH IMMEDIAL COLOURS.

The following Immedial Colours are well adapted for dyeing goods the silk effect threads of which are not to be stained:

Immedial Black NF, NG, NR, NRT, NN conc.,
NNG conc., NLN conc., NNR conc., *BF conc.
Immedial Brilliant Black B, 6BG conc., 8BG conc.
Immedial Brilliant Carbon F, FB, FG
Immedial Carbon B, R, JHJ
Immedial Brown B, *BR, W conc., 2R

- Immedial Dark Brown A
- Immedial Dark Brown D conc.
- *Immedial Cutch O, G, R, BG, BGG
- *Immedial Maroon B conc.
- *Immedial Bordeaux G conc., GF conc.
- Immedial Bronze A
- *Immedial Orange C
- Immedial Prune S
- Immedial Yellow Olive G
- *Immedial Yellow D
- Immedial Dark Green B
- Immedial Olive B, 3G
- Immedial Indogene B conc.
- Immedial Direct Blue B, R, OD.

The dyestuffs marked with an asterisk (*) stain the silk just very slightly, and are thus adapted in the first instance for coloured silk effects.

The best effects are obtained on mercerised goods. According to the kind of article to be produced, the mercerising is either done under tension in the ordinary mercerising machines with caustic soda lye of 48—52° Tw. and the addition of some glycerine, or, if this should not be feasible, without tension in a caustic soda lye of 18—20° Tw. The mercerising should be carried out as cold as possible, the goods being then immediately rinsed with a plentiful supply of water and neutralised with acid.

The dyeing is best done in an ordinary jigger provided with squeezing rollers.

BLACK.

Charge the bath with

- | | | | |
|----|--------|---------------------------|-------------------------|
| 1 | —2 lbs | Immedial Black NF | } per 10 gallons liquor |
| 1 | —2 „ | sodium sulphide crystals | |
| 1½ | —3 „ | glue | |
| | 8 oz | soda ash | |
| 2 | —3 lbs | desiccated Glauber's salt | |

and in addition thereto with

- | | | |
|---------|--------------------------|--|
| 8—10 % | Immedial Black NF | } reckoned on the weight of the goods. |
| 8—10 % | sodium sulphide crystals | |
| 12—15 % | glue | |

Charge the bath heated to 40° C. (105° F.) with all the ingredients previously well dissolved, dye for ¾ to 1 hour, squeeze off well, and rinse; to the first rinsing bath add some soda, and finally aftertreat with acetate or formate of soda, and dry.

For dyeing subsequent lots in the standing bath, charge the same with

8—10 %	Immedial Black NF	} of the weight of the goods
8—10 %	sodium sulphide crystals	
1 %	soda ash	
5 %	desiccated Glauber's salt	

and with about $\frac{1}{4}$ — $\frac{1}{5}$ of the quantities of glue used in the first bath.

BROWN, BLUE, GREEN, OLIVE AND MODE SHADES.

The baths are prepared approximately according to the instructions given for all-cotton fabrics (see the instructions for Immedial Colours on piece-goods, page 224), the quantities of dyestuffs however being reduced by about $\frac{1}{4}$ — $\frac{1}{3}$ for mercerised goods and 1—3 lbs glue per 10 gallons of dye liquor being added.

The dyeing in general is carried out as described for black, but when using Immedial Direct Blue B or OD, it is well to raise the temperature of the dye liquor to about 60° C. (140° F.).

SUBSEQUENT DYEING OF THE SILK.

Fancy effects are frequently produced by subsequent dyeing of the silk in a hot, feebly acidified bath with the following dyestuffs:

<i>Blue:</i>	Cyanol extra
	Pure Soluble Blue
<i>Red:</i>	Scarlet F3R
	Brilliant Croceïne 3B
<i>Yellow:</i>	Tropaeoline G
<i>Violet:</i>	Formyl Violet S4B
<i>Green:</i>	Acid Green extra conc.

PRODUCING THE SAME STYLE BY DYEING THE SILK PREVIOUSLY.

Very fine effects are obtained by dyeing the silk in the hank, and, after weaving, mercerising the piece and dyeing it with Immedial Colours.

The following dyestuffs resist mercerising and subsequent dyeing with Immedial Colours:

<i>Red:</i>	*Diamine Scarlet B, 3B
	Milling Red G
	Primuline, developed with Beta Naphthol
<i>Claret:</i>	Diamine Bordeaux B, S

- Orange:* Diamine Orange F
Yellow: *Diamine Yellow CP
 Milling Yellow O
Green: *Brilliant Milling Green B
Blue: Alkaline Blue
 *Formyl Blue B
 Victoria Blue B
Violet: *Formyl Violet S4B
 Diamine Violet N
Brown: Diamine Nitrazol Brown BD, RD,
 coupled with Nitrazol C.

When following this method, the goods must be prepared carefully before dyeing so that the coloured silk effect threads may not bleed.

The following method of working yields very satisfactory results:

1. Singeing the goods on the plate-singeing machine.
 2. Wetting out in the crabbing machine in a bath of 40—50° C. (105—120° F.) containing 3—4½ oz Turkey-red oil or Monosolvul per 10 gallons liquor.
 3. Rinsing in cold water.
 4. Wetting out in the crabbing machine in a boiling hot bath containing 4—8 oz acetic acid per 10 gallons liquor.
 5. Thorough rinsing.
 6. Mercerising in caustic soda lye of 42—52° Tw. as cold as possible; after mercerising, the goods should not be allowed to lie batched, but should be at once rinsed thoroughly, and neutralised with acetic or sulphuric acid.
- The goods may finally be neutralised with ammonia or soda, and are then ready for dyeing according to the above instructions.

If, for the production of *single coloured* effects, the interwoven silk threads are to be dyed in the piece, the mercerised goods may be dyed first in a boiling bath acidulated with acetic acid and charged with any of the above-named dyestuffs marked with an asterisk (*), and then cotton-dyed with Immedial Colours in the ordinary manner; the effects obtained by this means are clearer than when dyeing the silk subsequently, and the shade of the cotton is somewhat brighter, especially in the case of Blacks.

DYEING OF COTTON FABRICS WITH WHITE OR COLOURED WOOL EFFECT THREADS OR SELVEDGES.

A. DYEING WITH DIAMINE COLOURS.

The dyeing is usually carried out according to the same method and with the same dyestuffs as indicated on page 276 for goods with silk effect threads.

For Black, Diamine Black BH is used shaded with a little Diamine Fast Yellow A, and diazotised and developed with Beta Naphtol or Resorcine, or, a combination of Diamine Black No 31 and Oxidation Black is used in the following manner:

The goods are bottomed by dyeing for $\frac{1}{2}$ to $\frac{3}{4}$ hour in a jigger with

9½ oz Diamine Black No 31	} per 10 gallons liquor
12 oz soap	
1 lb Glauber's salt	

at a temperature of 30° (85° F.); they are then rinsed thoroughly, dried, and padded with an Oxidation Black liquor of about half the strength of the ordinary aniline bath.

The following may serve as a guide for preparing the aniline liquor:

- 2 lbs chlorate of soda are dissolved in
- 2 gallons boiling water, and
- 5 lbs 5 oz aniline salt in
- 1 gallon boiling water;

both solutions are allowed to cool, and mixed together, and to this mixture

- 2¾ oz sulphate of copper dissolved in
- 1 quart water and
- 3 quarts acetate of alumina of 15° Tw. are added.

This yields about 4 gallons aniline liquor of 12° Tw., which are diluted to 6—7° Tw. with cold water. The previously dyed pieces are impregnated with this liquor, dried, and oxidised, and only very slightly chromed; finally they are soaped well.

The pieces are also frequently mercerised previously, which results in much clearer wool effects being obtained. It is however necessary in this case to treat the goods only for 1 to 3 minutes with the lye of abt. 52° Tw. to which some glycerine has been added, and then to acidulate without delay, rinse, and dye.

B. DYEING WITH IMMEDIAL COLOURS.

The best effects are obtained on mercerised material. The tissue is mordanted for one hour in a boiling bath containing 2—2½ lbs formaldehyde and 3—8 oz tannic acid per 10 gallons liquor, this being best done in a jigger or vat, but may also be done in the padding machine; in the latter case the mordanting bath must be correspondingly strengthened with tannic acid (2—3 lbs per 10 gallons liquor) and the goods passed several times through, being then left rolled up for one hour. The material is then rinsed, and dyed immediately; the water used for mordanting must not contain any iron and no vessels with iron fittings should be used.

Immedial Colours are best dyed in the jigger at 25—40° C. (77—105° F.) with the addition of glucose. Dissolve the Immedial Colours with the requisite sodium sulphide and twice as much glucose, boil up briefly, add 3 oz soda, 3—4½ oz Turkey-red oil or Monosolvol and 1—2 lbs Glauber's salt per 10 gallons liquor, and dye for ½—¾ hour; squeeze off well, rinse quickly, and treat immediately at 60—70° C. (140—160° F.) with 3—5 oz hydrochloric acid and 2—4 oz bisulphite per 10 gallons liquor; rinse again thoroughly, and dry. For Black, 8 oz acetate of soda per 10 gallons liquor are added to the last rinsing bath.

Coloured wool effects may be dyed either before or after the cotton; in the first case this is best done before mercerising. If the cotton is to be dyed last, the wool is dyed in a boiling bath charged with a little acetic acid or bisulphate of soda, so that the dyestuff is absorbed as far as possible by the wool only; the goods are then mercerised and further treated as stated above.

The following Immedial Colours are suitable for the dyeing of cotton according to the method described above, and stain the wool either not at all or only slightly:

Immedial Cutch O, G, R, BG, BGG
 Immedial Bordeaux G conc., GF conc.
 Immedial Red Brown 3R
 Immedial Maroon B conc.
 Immedial Brown B, BR, RR, W conc.
 Immedial Dark Brown A
 Immedial Yellow Brown EN

Immedial Yellow Olive G, 5G
 Immedial Olive B, 3G
 Immedial Green GG extra, BB extra
 Immedial Brilliant Green G extra
 Immedial Deep Green G
 Immedial Dark Green B
 Immedial Indogene B conc.
 Immedial Direct Blue B, R, OD
 Immedial Blue C, CB, CR
 Immedial New Blue G conc.
 Immedial Black
 Immedial Carbon
 Immedial Brilliant Carbon

} all brands.

For previously dyeing the wool, the following dyestuffs are suited:

Red: Diamine Scarlet B, 3B
 Milling Red G
Blue: Brilliant Milling Blue B
 Victoria Blue B
 Alkaline Blue
Violet: Formyl Violet S4B
Yellow: Milling Yellow O
 Diamine Yellow CP
Green: Brilliant Milling Green B;

and for dyeing the wool subsequently:

Red: Scarlet F3R
 Brilliant Croceine 3B
Blue: Cyanole extra
 Pure Soluble Blue
Violet: Formyl Violet S4B
Yellow: Tropaeoline G
Green: Acid Green extra conc.

DYESTUFFS SUITABLE FOR PRODUCING DYEINGS FAST TO STORING.

The change in shade occasionally noticeable when *mercerised* goods or materials which have otherwise been given a *soft finish* are stored in damp places is in all probability to be attributed in the first place to the absorption of moisture; at the same time it is of importance to select the dyestuffs best adapted for the circumstances.

We have tested our dyestuffs most carefully in this direction and found the following to be the best suited:

DIAMINE COLOURS.

Thioflavine S

Diamine Fast Yellow A, AR, AGG, B, C, FF,
M, 3G

Diamine Yellow CP, CPO, CPI, CPII, N

Diamine Gold

Oxy Diamine Yellow GG, NY200, NYH, TZ, CR

Diamine Orange B, G, D, F

Diamine Fast Orange EG, ER

Diamine Nitrazol Orange R, coupled with Nitrazol C

Diamine Catechine 3G, B, BZ

Cotton Dark Brown BM

Diamineral Brown G

Diamine Cutch, boiled with soda

Diamine Fast Brown R, G, GB

Oxy Diamine Brown KS, KBS, KMS, KRS

Diamine Brown ATC, B, 2G, 3G, 5G, M, R, S, V

Diamine Brown No 31, 33, 34, 35, 36, 37, 38

Diamine Brown No 32, 45

Oxy Diamine Brown 3GN	} in medium and deep shades
Cotton Dark Brown BB	

Diamine Rose, all brands

Direct Rose T

Diamine Scarlet 3B

Diamine Fast Scarlet GG, GFF, 4BFF, 4BFS,
5BFF, 7BFF, 8BN, 8BF, 10BF

Diamine Brilliant Scarlet S

Diamine Red D, 5B

Diamine Red 4B, DN, in medium and deep shades

Diamine Azo Scarlet A, B, 4B, 8B,

developed with Beta Naphtol

Diamine Nitrazol Scarlet A, coupled with Nitrazol C	
Diamine Brilliant Rubine S	
Diamine Azo Bordeaux B, developed with Beta Naphtol	
Diamine Nitrazol Bordeaux GB, coupled with Nitrazol C	
Diamine Violet BB, N	
Oxy Diamine Violet G	
Diamine Violet RB	} In medium and deep shades
Diamine Brilliant Violet B	
Diamine Heliotrope B, G, O	
Oxy Diamine Violet B, BF, R	
Diamine Sky Blue, FF, FFN, FFS	
Diamine Pure Blue A	
Diamine Blue AZ, BG, BX, 2B, 3B, 6G, NC, 3R, RW	
Diamine Blue No. 50, 52, 53, 55, 56	
Diamine New Blue G, R	
Diamine Brilliant Blue G	
Diamine Bengal Blue G, R	
Diamine Deep Blue B, R	
Diamine Steel Blue L	
Diamineral Blue B, BF, 3B, R, RV, CV, CVB	
Diamine Dark Blue B	
Oxy Diamine Blue B, G, 3G, 5G, R, 3R	
Diamine Fast Blue FFB, FFG, G, BN	
Diamine Fast Brilliant Blue R	
Diaminogene Blue NA, 2RN, 3RN, 6RN, G	} diazotised and developed with Beta Naphtol
Diaminogene Dark Blue	
Diamine Azo Blue 6B, R, 2R	
Diamine Azo Blue No. 51, 54	} diazotised and developed with Beta Naphtol in medium and deep shades
Diaminogene Blue BB, NB	
Diamine Green B, BO, BZ, CL, NA, FG, G	
Diamine Dark Green N	
Diamine Nitrazol Green BB, S, coupled with Nitrazol C	
Diamine Nitrazol Green GF, coupled with Nitrazol C	
	in medium and deep shades
Diamine Grey G	
Diamine Fast Grey BN, RN, in medium and deep shades	
Diamine Black BH, BHN, BHR, BO, DN, DB, R O, HW	
Diamine Blue Black E, R	
Para Diamine Black B, BB, FF, FFB, FFD extra conc.	
Diamine Nitrazol Black B, BB, coupled with Nitrazol C	
Diaminogene B, BR, BW, CCL, extra, dyed direct or diazotised and developed.	

Oxy Diaminogene ED, EM, EF, OB, OBB,	} diazotised and developed
FF, FFG, FFN, OT, OV	
Diamine Azo Black B, R	
Diamine Beta Black B, BB, BGH	
Diamine Jet Black, all brands	} in medium and deep shades.
Diamineral Black, all brands	
Diamine Fast Black X, XN extra conc.	
Oxy Diamine Black, all brands	

IMMEDIAL COLOURS.

Immedial Olive B, 3G	
Immedial Green BB extra	
Immedial Brown BR, BRS, G, RR, W conc.	
Immedial Red Brown 3R	
Immedial Cutch BG, BGG, G, O, R	
Immedial Bronze A	
Immedial Khaki D	
Immedial Orange C	} in medium and deep shades
Immedial Brown B	
Immedial Dark Brown A	
Immedial Khaki G	
Immedial Prune S	
Immedial Purple C	
Immedial Violet C, CB, CR	
Immedial Indone Violet B conc.	
Immedial Bordeaux G conc., GF conc.	
Immedial Maroon B conc.	} in medium and deep shades
Immedial Deep Green G	
Immedial Dark Green B	
Immedial Green Blue CV	
Immedial Dark Blue CRV, J	
Immedial Direct Blue OD, R, JB, BB extra conc.	
Immedial Blue C, CB, CR	
Immedial Indogene BCL, GCL, RCL, RRCL conc.	
Immedial Indone B, 3B, 4B, BF, BBF, BN, JBN,	
JBF, R, RG conc.	
Immedial Direct Blue B, 4B, FCL,	} in medium and deep shades.
JND extra conc.	
Immedial Sky Blue	
Immedial Indone RB conc., RR conc.	
Immedial Indogene B conc.	
Immedial Black, all brands	

BASIC COLOURS.

Thioflavine T, TCN
Tannin Orange R
Safranine, all brands
Irisamine G
Tannin Heliotrope
New Methylene Blue N, R, GG
Methyl Indone B, R
Naphtindone BB
Metaphenylene Blue { all brands
New Blue }
Indazine M
Brilliant Green
Solid Green

Isamine Blue B, 6B, 8B, R

Hydron Blue, all brands.

VARIOUS AFTERTREATMENTS.

Staining the Size with Logwood.

For black shirtings, glacés and similar materials with a hard finish, the finishing size is frequently stained with logwood.

. For 100 gallons size, the usual quantities are:

10 galls.	logwood extract	52° Tw.
1¼ "	fustic extract	52° Tw.
3½ quarts	nitrate of iron	77° Tw.
3¾ lbs	bichrome.	

Size stained for Twilled Goods dyed with Immedial Colours.

10 gallons Size.

17 lbs	yellow dextrine
10 "	syrup
2 "	Turkey-red oil
1 lb	glycerine
1½ oz	coca-nut fat
8 "	acetate of soda
1 pint	logwood extract 52° Tw.
½ "	pyrolignite of iron
1⅛ oz	bichrome.

Brightening of Piece-Goods dyed with Immedial Black.

Give the material two ends on the padding machine at boiling temperature through the following bath:

50 galls.	condensed water
2 lbs	yellow dextrine
3 "	glycerine
5 "	soft soap
2 "	olive oil, sweet oil or rape-seed oil
3 "	ammonia
2½ "	acetate of soda.

After impregnating the pieces, dry immediately, for preference in the hot-flue.

Blueing of Bleached Piece-Goods.

For this purpose, Alizarine Cyanole EF and B, or Alizarine Cyanole Violet R, in view of their very good fastness to light, are very useful and may serve for any gradation of white.

According to the degree of bleaching and the effect desired, $\frac{1}{4}$ —3 drms dyestuff are required per 100 gallons of dressing.

Dyeings Fast to Water.

For certain materials, such as satin for quilts, buntings, etc., importance is placed on good fastness to water.

For the dyestuffs coming into consideration, as well as for the methods of aftertreatment for improving the fastness to water, see page 123.

Stripping Dyed Goods with Hyraldite Z for Stripping.

If fabrics dyed with Diamine Colours are to be stripped, this is best done with Hyraldite Z for Stripping, with which any of the Diamine Colours with the exception of

Diamine Fast Yellow A, B, FF, M
Oxy Diamine Yellow GG, TZ
Thioflavine S and
Primuline

may be stripped or removed sufficiently without any risk of tendering the fibre, which may easily occur by the use of chloride of lime. After the stripping and rinsing, the goods may be dyed up again at will.

For further particulars of the stripping with Hyraldite see the paragraph on Hyraldite in the Supplement.

DYEING OF OTHER FIBRES.

1. Artificial Silk.
 2. Linen Yarn, and Linen and Half-Linen Fabrics.
 3. China-Grass (Ramie).
 4. Kapok.
 5. Jute, Cocoa-Nut Fibre and Piassava.
 6. Fibre, Manila Hemp and Sisal.
-

DYEING OF ARTIFICIAL SILK.

The various kinds of Artificial Silk are distinguished in the trade as: *Chardonnet Silk*, "*Glanzstoff*" and *Viscose Silk*.

Chardonnet Silk — known also as Frankfort Artificial Silk, Nitro Silk, Besançon Silk, Tubize Silk, Hungarian Silk — possesses distinct affinity for Basic Colours, and therefore can be dyed with these colouring matters with the addition of some acetic acid, without mordanting, if there are no special requirements for fastness.

The Diamine and Immedial Colours dye this kind of artificial silk more slowly, which is frequently desired.

"*Glanzstoff*" — which frequently also goes under the name of Elberfeld or Oberbruch Artificial Silk — behaves much the same in the dyeing as cotton, except that it has a greater affinity for dyestuffs than the latter. The Diamine Colours come in the first place into consideration for *Glanzstoff*.

Viscose Silk (*Luna Silk*) has somewhat more affinity for Basic Colours than "*Glanzstoff*", but also for this kind of artificial silk the Diamine and Immedial Colours have proved the best suited dyestuffs.

In addition to the above kinds of artificial silk, there are some other specialties which come into consideration as substitutes for horse-hair, polished yarn, etc.; of these we may mention the following:

Meteor, a fabric dyed like *Chardonnet Silk*,

Sirius and *Excelsior* dyed like "*Glanzstoff*",

Viscelline Yarn, which is cotton yarn coated with *Viscose Silk* and is dyed like the latter.

For the different manufactures of artificial silk, the same dyestuffs as a rule may be used as for cotton yarn, the same methods of dyeing also being followed. The groups which come in the first place into consideration are:

A. Diamine Colours

B. Basic Colours

C. Immedial Colours

D. Acid Colours

E. Diamine and Immedial Colours, topped with
Basic Colours.

For Diamine, Basic and Acid Colours, wooden vats as a rule are used, which for preference are copper-lined. The same vessels may serve as for cotton and silk yarn. Particular care should be taken that the sticks used for turning the silk are very smooth.

For the dyeing of Immedial Colours, wooden vats should be used provided with a pair of squeezing rollers fixed at one end; the vessels should contain no copper parts, and any copper or brass steam-pipes, valves, etc. should be replaced by iron or hard lead ones.

Artificial Silk has to be treated very carefully owing to the risk of being torn, when in a wet state, and above all it should not be treated any longer than necessary. As a rule, the temperature of the dyebaths should not exceed 50—70° C. (120—160° F.), but Glanzstoff and Viscose Silk may be dyed at a higher temperature. After dyeing, the goods must always be rinsed cold, care being taken that the wet silk is not stretched too severely, and above all that it is dried at a moderate temperature only, heat rendering every kind of artificial silk brittle.

A. DYEING CHARDONNET SILK, GLANZSTOFF AND VISCOSE SILK WITH DIAMINE COLOURS.

The Diamine Colours are usually dyed with the same amounts of Glauber's salt, common salt and soda as customary for cotton yarn. Monosolvol has proved in practice a suitable addition, which facilitates the levelling and imparts a soft feel to the artificial silk. Glanzstoff as a rule absorbs the dyestuff more easily than cotton, and for this reason smaller quantities of salt are added for this material; for light shades salt is being omitted altogether.

For colours, the liquor should be 30 times, and for very dark shades and Blacks 20—25 times, the weights of the material to be dyed.

The following additions are to be recommended:

For light shades:

$\frac{1}{2}$ —1% soda ash
1—2% Monosolvol.

For somewhat deeper shades:

3—5% phosphate of soda or
2—3% Glauber's salt cryst. may be added.

For medium and deep shades:

$\frac{1}{2}$ — 2% soda ash
1— 2% Monosolvol, and, depending on the
depth of shade to be dyed,
10—20% desiccated Glauber's salt.

Dye for $\frac{1}{2}$ to $\frac{3}{4}$ hour, light shades at about 30—40° C. (85—105° F.), medium and deep shades at 60—70° C. (140—160° F.); for Viscose silk the temperature may be still increased in order to better exhaust the dyebath.

The dyebaths do not exhaust, especially with deep shades, and can therefore be used to advantage for future lots; in such case, $\frac{3}{4}$ — $\frac{4}{5}$ of the starting quantities of dyestuff in the case of Glanzstoff, or about $\frac{2}{3}$ in the case of Chardonnet and Viscose Silk, and about $\frac{1}{4}$ — $\frac{1}{5}$ of the original quantities of soda, Monosolvol and Glauber's salt are necessary.

Any *topping with Basic Colours* that may be required is carried out in the customary manner in a fresh, cold bath well acidulated with acetic acid.

The diazotising and developing, the coupling with Nitrazol C, and the aftertreatment with metallic salts or formaldehyde, which methods are employed for the production of dyeings of especially good fastness, are carried out according to the recipes indicated for cotton on pages 10—20.

B. DYEING WITH BASIC COLOURS.

1. On Glanzstoff:

For dyeing Glanzstoff with Basic Colours, it is necessary as a rule to mordant previously with tannic acid and antimony salts as in the case of cotton. Light shades without any special requirements for fastness may however be dyed in a weak acetic acid bath without any previous mordanting as given further on for Chardonnet Silk.

Mordanting:

For mordanting, the yarn is treated for 2 to 3 hours in a bath of about 50° C. (120° F.) charged, according to the depth of shade to be produced, with

2—4% tannic acid and
½—1% hydrochloric acid.

The goods are then lifted, hydroextracted or squeezed off carefully, fixed for 20 minutes in a fresh cold bath charged with 1—2½% antimony salt, and then rinsed.

Dyeing:

Charge the cold dyebath with

5—10% acetic acid,

give the mordanted material a few turns, then add the dyestuff solutions in several portions through a fine sieve, and raise the temperature finally to 50—60° C. (120—140° F.).

For producing dyeings fast to acids for effect threads, the goods are taken again through the old mordanting baths, which are charged with ⅔ of the original quantities, being treated in each bath for about ½ hour, and then rinsed.

2. Chardonnet Silk:

When dyeing Chardonnet Silk, it is not as a rule necessary, even for deep shades, to mordant previously with tannin and antimony salt, such process only being resorted to when special requirements are made of the goods in point of fastness to water, washing and light, or when the colours are required for effects fast to acids in wool goods.

On previously mordanted material also considerably fuller shades are obtained.

Chardonnet Silk as a rule is dyed as follows:

Charge the cold dyebath in the first place with

5—10% acetic acid,

turn the artificial silk several times therein, add the dyestuff in solution, and finally heat the bath to 50—60° C. (120—140° F.).

Any mordanting with tannin and antimony which may be necessary is carried out as shown above for Glanzstoff.

3. Viscose Silk.

Viscose Silk stands between Glanzstoff and Chardonnet Silk in its behaviour in dyeing with Basic Colours; it has greater affinity towards Basic Colours than the former, and less than the latter.

Light and medium shades are therefore usually dyed in the same way as Chardonnet Silk without any preliminary mordanting, whereas for dark shades it is preferable to mordant previously with tannic acid and antimony salts as in the case of Glanzstoff.

C. DYEING CHARDONNET SILK AND GLANZSTOFF WITH IMMEDIAL COLOURS.

The *Immedial Colours* are used for dyeing shades of especially good fastness to washing and light. They may all be used for dyeing artificial silk, according to the recipes given on page 67 for cotton yarn; it is advisable however not to exceed a temperature of 50° C. (120° F.) in dyeing, and to use somewhat smaller quantities of soda and Glauber's salt. Some Monosolvol is for preference added to the dyebath.

The dyebath, containing a volume of liquor about 30 times the weight of the goods to be dyed, is charged with the dyestuff and the following ingredients:

Double the weight of sodium sulphide crystals as of dyestuff,

1% soda ash	} of the weight of the goods to be dyed.
2% Monosolvol	
0—10% desiccated Glauber's salt	

Enter the goods at 50° C. (120° F.), work for about $\frac{3}{4}$ hour, turn each stick two or three times, press off carefully, and rinse immediately in cold water.

Glanzstoff and Viscose Silk are then soaped hand-warm, rinsed, and weakly acidulated with acetic acid. In the case of Chardonnet Silk it is best to omit the soaping and merely to acidulate slightly.

When dyeing with Immedial Black and Immedial Carbon, it is necessary to add $\frac{1}{2}$ to 1 lb acetate or formate of soda per 10 gallons liquor to the last rinsing or brightening bath.

The dyebaths, especially in case of deep shades, are not exhausted entirely, and may therefore be used over again for subsequent lots; one-half to two-thirds of the

original quantities of dyestuff are then sufficient for replenishing. Of sodium sulphide, double the weight as of dyestuff and a quarter the weight of soda and Monosolvol used originally will be found the right quantities; a further addition of Glauber's salt is not required.

D. DYEING CHARDONNET SILK AND GLANZSTOFF WITH ACID COLOURS AND ISAMINE BLUE.

Eosine, Erythrosine, Rosazeine and Rose Bengale are dyed for $\frac{1}{2}$ hour at 30—40° C. (85—105° F.) in a short bath charged, in addition to the requisite dyestuff, with
2 lbs common salt per 10 gallons liquor.

The goods are then lifted, whizzed lightly, and dried without rinsing.

Methyl Blue, Water Blue and Isamine Blue are dyed for $\frac{1}{2}$ hour at abt. 40° C. (105° F.) with the addition of
10% alum;

Isamine Blue may also be dyed with

1—2 lbs Glauber's salt	} per 10 gallons liquor.
3 oz acetic acid	

The goods are then whizzed, and dried without rinsing

E. DYEING WITH DIAMINE AND IMMEDIAL COLOURS AND TOPPING WITH BASIC COLOURS.

Artificial Silk is dyed with Diamine or Immedial Colours according to the ordinary directions, and well rinsed; then about 5% acetic acid are added to the clear rinsing bath, the goods being turned a few times, and the dyestuff added in 2—3 portions. Finally, the whole is gradually and gently warmed.

BRIGHTENING OF ARTIFICIAL SILK.

Dyed artificial silk is frequently brightened after dyeing, in order to impart to it greater brilliancy and suppleness or a more silky handle. For dyeings produced with Diamine and Immedial Colours an oil and soda solution is used, for a harder feel an emulsion of about 3% olive oil, 3—5% glue and 10—15% acetic acid, which are boiled up together before use. This latter emulsion may also be used for Basic Colours. — The goods are brightened at 30—40° C. (85—105° F.), and dried cold without rinsing.

THE PRODUCTION OF THE MOST CURRENT SHADES ON ARTIFICIAL SILK.

Unless specially mentioned, the dyestuffs and combinations indicated may be applied for every kind of artificial silk.

Grey Shades:

Diamine Fast Grey BN	} These dyestuffs yield shades of good fastness to light.
Diamine Grey G	
Diamine Jet Black SS, Cr, RB	
Diamine Dark Blue B	
Diamine Fast Black F, X	
Diamine Black DN	

For shades fast to washing which stand also acid cross-dyeing:

Diamine Black BH	}	diazotised and developed with Phenylene Diamine, Resorcline, Phenylene Diamine and Resorcline, or Phenylene Diamine and Beta Naphtol.
Oxy Diaminogene FFN		
Immedial Black NB, NF, NRT, NN conc., NNG conc.		

The shades produced with Immedial Colours are also of excellent fastness to light.

Mode Shades:

The following are the best combinations:

Diamine Bronze Brown PE
Diamine Yellow CP
Diamine Fast Grey BN
Diamine Brown M
Oxy Diamine Brown G, RN
Oxy Diamine Orange G, R.

Of good fastness to light:

Diamine Fast Grey BN
Diamine Fast Orange ER
Diamine Fast Brown G, R
Diamine Yellow CP.

The following products yield shades of good fastness to washing, at the same time resisting acid cross-dyeing:

Primuline	} diazotised and developed with Resorcline or Resorcline and Beta Naphtol.
shaded with	
Diamine Black BH	
Oxy Diaminogene FFN	
Diamine Brown M	

Further, combinations of

Immedial Yellow Olive G, 5G
 Immedial Cutch O, BG,
 Immedial Brown BR, RR, W conc.
 Immedial Black NRT.

The shades produced with Immedial Colours are also of excellent fastness to light.

Brown Shades:

The following are used for cheap dyeings:

Oxy Diamine Brown G, RN
 Diamine Brown 30a, GG, R, S
 Diamine Bronze Brown PE
 Diamine Nitrazol Brown BD

shaded with

Diamine Yellow CP
 Oxy Diamine Orange G
 Diamine Black BH
 Diamine Heliotrope B

further:

Bismarck Brown FF, GG
 shaded with
 Safranine G extra No 0
 Solid Green crystals O

} principally for Chardonnet
 Silk; Glanzstoff and
 Viscose Silk must be
 mordanted before dyeing.

For browns faster to light:

Diamine Fast Brown G, R
 Diamine Fast Orange ER
 shaded with
 Diamine Yellow CP
 Diamine Fast Grey BN
 Diamine Violet N.

Brown shades fast to washing and resisting acid cross-dyeing are produced with

Primuline in combination with
 Diamine Black BH

} diazotised and developed
 with Resorcine or
 Phenylene Diamine

further:

Immedial Cutch O, BG
 Immedial Brown RR, BR, W conc.
 Immedial Dark Brown D conc.

shaded with

Immedial Yellow Olive G, 5G
 Immedial Black NRT.

The shades produced with Immedial Colours are also of excellent fastness to light.

Cream Shades:

The following are especially well suited:

Diamine Fast Yellow FF, A
Diamine Fast Orange EG, ER
Diamine Yellow CP.

Yellow Shades:

The brightest yellows are obtained with

Thioflavine S
Oxy Diamine Yellow TZ
Diamine Fast Yellow FF
Diamine Yellow CP

further:

Thioflavine T, TCN	} in deep shades on Glanzstoff and Viscose Silk, to be dyed on a tannin-antimony mordant.
Para Phosphine GG	

Yellows fast to washing are produced with

Diamine Fast Yellow FF, A	} on a tannin-antimony mordant
Para Phosphine GG, G, R	
Diamond Phosphine GG, R	
Immedial Yellow D, GG	

Diamine Fast Yellow FF and A are besides excellently fast to light.

Yellow shades fast to washing and resisting acid cross-dyeing are produced with

Primuline, treated with chloride of lime or diazotised
and developed with Phenol.
Thioflavine T, TCN, dyed on a tannin-antimony mordant.

Orange Shades:

Bright Orange:

Tannin Orange R	} in deep shades on Glanzstoff and Viscose Silk, to be dyed on a tannin-antimony mordant
Tannin Orange GG	
Oxy Diamine Orange G, R	
Diamine Orange F.	

Of better fastness to light:

Diamine Fast Orange ER
shaded with
Diamine Yellow CP
Diamine Rose FFB.

Orange shades fast to washing:

Primuline, diazotised and developed with Resorcine	
Tannin Orange R	} dyed on a tannin-antimony mordant.
Para Phosphine R	
Diamond Phosphine R	
Immedial Orange C.	

Primuline also resists acid cross-dyeing.

Pink Shades:

In the first place the following come into consideration:

Diamine Rose BD, BG, GD, B extra, FFB,	
Direct Rose T	[FFB extra

which yield light shades of good fastness to washing; the Diamine Rose brands also possess good fastness to light.

The following are used for producing fuller shades of pink fast to washing:

Irisamine G	} dyed on a tannin-antimony mordant.
Rosazeïne 6G	

The following products are used for dyeing very bright pink shades of minor properties of fastness:

Eosine	
Phloxine	
Erythrosine	
Rose Bengale extra N	
Irisamine G	} chiefly dyed direct on Chardonnet silk.
Rosazeïne 6G	

Red Shades:

For direct dyeings:

Diamine Brilliant Scarlet S
 Diamine Red 4B, 6B, 10B
 Diamine Purpurine B, 3B, 6B
 Diamine Fast Red F, 8BL
 Diamine Fast Scarlet GG, GFF, 4BFF, 4BFS,
 5BFF, 7BFF, 8BF, 8BN, 10BF.

Of the above, Diamine Red 4B, 6B, 10B possess the best fastness to washing, the Diamine Fast Scarlets the best fastness to acids, and Diamine Fast Red 8BL the best fastness to light.

The following are used for producing red shades fast to washing and also of good fastness to light.

Safranine, all brands	}	dyed on a tannin-antimony mordant.
shaded with		
Thioflavine T, TCN Para Phosphine GG		

Reds fast to washing and withstanding also acid cross-dyeing are produced with

Primuline	}	diazotised and developed with Beta Naphtol.
Diamine Azo Scarlet A, B, 4B, 8B		

For Claret and Violet Shades:

For direct dyeings:

Diamine Bordeaux B	}	for Chardonnet silk.
Diamine Bordeaux S		
Diamine Brilliant Bordeaux R		
Diamine Violet N		
Diamine Brilliant Violet B, RR		
Diamine Heliotrope B, G, O		
Oxy Diamine Violet B, G, R, BF		
Magenta		
Cerise Ia		
Tannin Heliotrope		
Crystal Violet 10B		
Methyl Violet, all brands		
New Methylene Blue R, 3R		

For shades of good fastness to light:

Diamine Fast Bordeaux 6BS
Diamine Bordeaux B
Diamine Brilliant Bordeaux R
Diamine Fast Violet FFBN, FFRN
Diamine Violet N
Tannin Heliotrope, dyed on a tannin-antimony mordant.

For dyeings fast to washing:

*Primuline	}	diazotised and developed with Bordeaux Developer or Beta Naphtol.
shaded with		
Diamine Azo Blue R, 2R		
*Diamine Black BH		
*Diamine Azo Bordeaux B	}	diazotised and developed with Beta Naphtol
Diamine Nitrazol Bordeaux GB,		
coupled with Nitrazol C		

Magenta	} dyed on a tannin-antimony mordant.
Cerise Ia	
Tannin Heliotrope	
*Crystal Violet 10B	
Methyl Violet 6B—4R	
*New Methylene Blue R, 3R	
and	
Immedial Bordeaux G conc., GF conc.	
Immedial Maroon B conc.	
*Immedial Red Brown 3R	
Immedial Purple C	
Immedial Violet C, CB, CR	
*Immedial Indone Violet B conc.	
topped with	
Safranine	
Tannin Heliotrope	
Methyl Violet 6B—4R	
New Methylene Blue R, 3R.	

The dyestuffs marked with an asterisk (*) also resist acid cross-dyeing.

For Blue Shades:

Bright blue shades:

Diamine Sky Blue FF, FFN, FFS

Diamine Brilliant Blue G

Oxy Diamine Blue 5G

topped with

New Methylene Blue GG, N, R

Methylene Blue BB.

For very bright shades:

Isamine Blue 8B, 6B, B, R

Methyl Blue for Cotton

Water Blue B, RB, R

Pure Soluble Blue

Blue JBP, JB, BS, FS

New Methylene Blue, all brands	} for Chardonnet silk.
Methylene Blue BB	

For deep blues and navies:

Diamine Blue 2B, 3B, RW, BX, 3R

Diamineral Blue CV, CVB, 3RC

Oxy Diamine Blue 3G, G, B, R

Diamine Bengal Blue R

Diamine Azo Blue R

Diamine Black BH

combined with
Oxy Diamine Violet B;

further:
Indazine, all brands
Naphtindone BB
New Blue, all brands

} for Chardonnet silk, and
also for topping.

For shades of superior fastness to light:

Diamine Fast Blue G, FFB, FFG, BN
Diamine Fast Brilliant Blue R

or
Diamine Sky Blue FF
Diamine Blue RW
Diamine Brilliant Blue G

} aftertreated with
copper sulphate.

For shades fast to light and washing:

*New Methylene Blue GG, N, R
*Methylene Blue BB
Naphtindone BB
New Blue, all brands

} dyed on a tannin-
antimony mordant.

*Diaminogene Sky Blue N
*Diaminogene Blue NA, NB,
2RN, 3RN, 6RN

} diazotised and developed
with Beta Naphtol.

*Immedial Direct Blue, all brands
Immedial Indone, all brands
*Immedial Indogene GCL conc., BCL conc.,
RCL conc., RRCL conc.
Immedial Indogene B conc.

The dyestuffs marked with an asterisk (*) resist acid cross-dyeing.

For Green and Olive Shades:

For direct dyeings:

For green:

Diamine Green G, B, CL, FG
Diamine Dark Green N
shaded with
Diamine Yellow CP
and topped with some
Brilliant Green crystals extra.

Combinations of

Diamine Sky Blue FF with
Diamine Yellow CP
Oxy Diamine Yellow TZ
Thioflavine S.

Solid Green Crystals O	} for very bright greens, especially on Chardonnnet silk.
Brilliant Green Crystals extra shaded with	
Para Phosphine GG	
Diamond Phosphine GG	

For olive:

Combinations of

Diamine Green CL, FG, G
 Diamine Dark Green N
 Diamine Yellow CP
 Diamine Bronze Brown PE
 Diamine Fast Grey BN.

For shades fast to washing:

*Solid Green Crystals O	} dyed on a tannin- antimony mordant,
*Brilliant Green crystals extra	

and for dyeings faster to light:

Diamine Nitrazol Green GF, BB, S,
 coupled with Nitrazol C

*Methylene Blue BB	} dyed on a tannin- antimony mordant;
*New Methylene Blue GG shaded with	
*Thioflavine T, TCN	
Para Phosphine GG, R	
Diamond Phosphine GG, R	

further:

*Immedial Green, all brands
 *Immedial Brilliant Green G extra
 Immedial Deep Green G
 *Immedial Dark Green B
 *Immedial Olive B
 *Immedial Yellow Olive 5G, G
 shaded with
 Immedial Yellow GG, D
 *Immedial Cutch, all brands.

The dyestuffs marked with an asterisk (*) resist also acid cross-dyeing. The shades produced with Immedial Colours are of excellent fastness to light.

Black:

For cheap direct dyeings the following products are used:

Oxy Diamine Black JE, JE extra conc., JEI,
 JEI extra conc., JB, JB extra conc., JW,
 sometimes shaded with JW extra conc.
 Diamine Green CL
 or
 Diamine Dark Green N.

For Blacks of superior fastness to light:

Black for Artificial Silk GL, BV extra, KBN
 Diamine Fast Black F, X, XN extra conc.,
 C high conc., CB high conc.
 Diamine Black DB, DN.

For Chardonnnet silk, the following products in addition to those indicated above:

Black for Artificial Silk B, G, BN, GN, 3GN, GNW, T,
 dyed direct with acetic acid same as Basic Colours.

The following products yield blacks fast to washing and light:

*Diaminogene B, extra	} diazotised and developed with Beta-Naphtol, or for jet black, with Phenylene Diamine.
*Oxy Diaminogene FFN, OB, OT	
Diamine Black DB, DN	
*Immedial Brilliant Black B, 5BV conc., 6BG conc., 8BG conc.	
*Immedial Black NG, NB, NN conc., NBB conc.,	
*Immedial Carbon B, JHJ, R	[NNG conc.]
*Immedial Brilliant Carbon F, FG.	

In the case of Immedial Black and Immedial Carbon, $\frac{1}{2}$ —1 lb acetate or formate of soda should be added per 10 gallons to the last rinsing bath after the dyeing and also after the acid cross-dyeing.

The dyestuffs marked with an asterisk (*) also resist acid cross-dyeing.

For blacks on the specialties called *Meteor*, *Sirius*, *Excelsior*, *Viscelline yarn*, etc., *Diamine Fast Black F*, *Black for Artificial Silk GL*, and *KBN*, and *Diaminogene B*, the last-named product diazotised and developed with Phenylene Diamine or Beta Naphtol, are particularly well suited.

After dyeing, these materials are usually brightened with an emulsion of oil and soda in order to increase their brilliancy, and are then dried at a moderate temperature and stretched as much as possible.

DYEING OF COTTON FABRICS CONTAINING ARTIFICIAL SILK.

In dyeing cotton fabrics containing artificial silk, the two fibres generally behave differently, and the different kinds of artificial silk also differ from each other in their behaviour.

In order to dye the cotton tissues containing artificial silk as evenly as possible, it is necessary in the first place therefore to make a careful choice of dyestuffs suitable for the purpose, and then again to dye at the right temperature.

The dyestuffs best suited for this article are the Diamine Colours; the products which come in the first place into consideration, both as suitable dyestuffs and with regard to the method of their application, are those given below as adapted for artificial silk embroidery.

DYEING OF ARTIFICIAL SILK EMBROIDERY.

The designs in artificial silk embroidery as a rule consist of artificial silk, cotton being used at the same time to give the article stability.

The artificial silk and cotton are frequently dyed separately in the hank, but often too the goods are dyed in the embroidered state. In the latter case, the Diamine Colours come mainly into consideration; for blacks, Immedial Black is occasionally used.

In dyeing artificial silk embroidery, it must be remembered that nearly all dyestuffs behave differently towards cotton than towards artificial silk. In order therefore to obtain as level dyeings as possible, it is necessary to select specially suitable dyestuffs for the purpose, and it moreover makes a difference whether the embroidery consists of Glanzstoff, Viscose or Chardonnet silk, because these different kinds of artificial silk behave also differently from one another in the dyeing.

Glanzstoff, which is apt to be dyed a deeper shade than cotton, is dyed for preference with the following dyestuffs at as low a temperature as possible (30—60° C. or 85—120° F.) :

For Yellow and Orange:

Diamine Fast Yellow A, AGG

Thioflavine S

Diamine Orange G, D

Diamine Fast Orange EG, ER

For Pink and Red:

Diamine Rose BD, GD
 Diamine Fast Scarlet GFF, 4BFF, 4BFS, 7BFF,
 Diamine Fast Red F. [10BF

For Claret and Violet:

Diamine Brilliant Rubine S
 Diamine Bordeaux B
 Diamine Fast Violet FFBN, FFRN
 Diamine Violet BB
 Diamine Heliotrope O, G.

For Blue:

Diamine Fast Blue FFB, BN
 Diamine Dark Blue B
 Diamine Black BH
 Oxy Diamine Blue 5G, 3G, G, B
 Diamineral Blue CV, CVB, 3RC.

For Green:

Diamine Green CL
 Diamine Dark Green N.

For Brown:

Diamine Fast Brown G, R, GB
 Diamine Brown S, M, No 33, 36, 37
 Oxy Diamine Brown RN.

For Grey:

Diamine Fast Black F, X, XN extra conc.,
 C high conc., CB high conc.

For Black:

Diaminogene B
 Oxy Diaminogene FFN
 Diamine Black DN
 Black for Artificial Silk GL, BV extra, KBN.

} diazotised and developed with
 Phenylene Diamine.

For *Chardonnet* and *Viscose silk*, the following dye-stuffs come into consideration, which may also be dyed at a higher temperature:

For Yellow and Orange:

Diamine Yellow CP
Diamine Fast Yellow B, FF, 3G, M
Thioflavine S
Oxy Diamine Yellow TZ
Diamine Orange F
Oxy Diamine Orange G, R.

For Pink and Red:

Diamine Rose BD, GD, FFB
Direct Rose T
Diamine Fast Scarlet GFF, 4BFF, 4BFS, 7BFF,
Diamine Fast Red F. [10BF

For Claret and Violet:

Diamine Bordeaux B, VRO
Diamine Brilliant Bordeaux R
Oxy Diamine Violet G, R, B
Diamine Brilliant Violet B, RR
Diamine Fast Violet FFBN, FFRN
Diamine Heliotrope G, O, B.

For Blue:

Diamine Fast Blue FFB, FFG, BN
Diamine Sky Blue FF, FFN, FFS
Diamine Pure Blue A
Diamine Blue 3B, 2B
Diamine Blue RW
Diamine Brilliant Blue G
Diamineral Blue CV, CVB, B
Oxy Diamine Blue, all brands.

For Green:

Diamine Green B, G, FG
Diamine Dark Green N.

For Brown:

Diamine Brown M, MR, R, S, No 33, 37, 38, 42, 43
Diamine Catechine 3G, G
Oxy Diamine Brown 3GN, G.

For Grey:

Diamine Fast Black F, X, XN extra conc.

For Black:

Diaminogene B	} diazotised and developed with Phenylene Diamine.
Oxy Diaminogene FFN	
Diamine Black DN	

Black for Artificial Silk GL, BV extra, KBN.

The dyeing is carried out in the manner customary for artificial silk with the addition of $\frac{1}{2}$ —1% soda and 1—2% Monosolvol; if deep shades are required and the embroidery is not too thick, up to 10% Glauber's salt may be added.

When the artificial silk embroidery is very thick, necessitating dyeing at a higher temperature, it is advisable to reduce the affinity of the dyestuff for the artificial silk, especially in the case of Glanzstoff, by a treatment before dyeing with tannic acid and tin crystals.

Treat the material for several hours in a bath of 60—70° C. (140—160° F.) containing 10—15% tannic acid (of the weight of the material); then enter a second, lukewarm bath containing $\frac{2}{3}$ the amount of tin crystals as of tannic acid indicated, the tin crystals being for preference dissolved with the addition of a little hydrochloric acid. Then rinse the goods thoroughly. The dyeing takes place at elevated temperature (80° C. — or 175° F. — to boiling hot) in the ordinary manner.

Better penetration may be ensured also by dyeing in apparatus at a lower temperature; see page 132.

CARBONISING OF COTTON AND ARTIFICIAL SILK EMBROIDERIES.

Some kinds of burnt out embroideries which consist partly of pure cotton and partly also of artificial silk and cotton, are prepared on a ground of wool or cotton. The ground is then usually carbonised before the dyeing, that is to say, removed so that the actual embroidery alone remains standing out.

For cotton embroidery, a wool ground is usually used, and is carbonised by a hot treatment or by boiling for 20 to 30 minutes with caustic soda lye of 3—5° Tw. The embroidery is then rinsed thoroughly, soured off, and dried, the destroyed wool then being removed by beating.

For artificial silk embroidery, wool is likewise used as a ground, but cotton, particularly of late, is frequently used for the purpose after being impregnated with salts which split-off acid, such as aluminium chloride, magnesium chloride, sodium bisulphate etc. In connection with the destroying of the wool in the case of artificial silk embroidery, it must be remembered that the wool tissue should not be too strong, so as to require the use of very strong or very hot lye, otherwise the artificial silk might also be destroyed.

If impregnated cotton material is used as a ground, the carbonising is done by passing the embroidery through hot carbonising chambers. It has to be observed that the materials must be stored as dry as possible and not too long, as the acid contained in the impregnated material is apt to be imparted to the artificial silk and to thus destroy it. After the carbonising, the cotton dust must be thoroughly removed and the goods then rinsed well.

The carbonising is best done before dyeing, but it can also take place after the dyeing. This is principally the case with black, diazotised blacks such as Oxy Diaminogene OT, FFN and Diaminogene B, diazotised and developed with Phenylene Diamine, being used.

DYEING OF LINEN YARN, AND LINEN AND HALF-LINEN FABRICS.

Preparatory to the dyeing process, a boiling out or bleaching is usually necessary as in the case of cotton; for dark shades it is sufficient to boil with 5—10% soda.

The dyestuffs stated as suitable for cotton yarn and cotton fabrics are likewise suitable for the dyeing of linen yarn, and linen and half-linen fabrics. It should however be borne in mind that the linen fibre is harder than cotton and not so easily penetrated; the absorption of the dyestuffs must therefore be retarded as far as possible.

The *dye vessels* used for *linen yarn* are ordinary vats as required for cotton, which for dyeing Immedial Colours must not contain any copper or brass parts and should be provided with squeezing rollers.

For *piece-goods*, the ordinary jigger is used when dyeing with Diamine or Basic Colours, and for Immedial Colours, the so-called Immedial jigger. In some cases blue linen is dyed in a jigger with the batch rollers submersed in the liquor.

DIAMINE COLOURS.

Exhausting of *Diamine Colours* is delayed either by omitting or diminishing the additions of common salt. by slightly increasing the quantity of soda ash, or by adding either soap, Turkey-red oil or Monosolvol to the dyebath.

The following colours are chiefly employed:

For Blue: Diamine Sky Blue FF or *Diamine Blue RW*, aftertreated with copper sulphate, for pale bright shades; the *Diamine Fast Blue* brands for medium shades of blue, and for deep shades the various *Diamineral Blues* shaded with *Diamine Dark Blue B*, dyed direct or aftertreated with copper sulphate.

If special demands are made with regard to fastness to washing, the *Diaminogene Blue* brands, diazotised and developed with Beta Naphtol, may also be used.

Blue shades are mostly topped with Basic Colours such as *Naphtindone* or *New Methylene Blue*; in the case of *Diamineral Blue*, *Diamine Sky Blue* and *Diamine Blue RW*, the sulphate of copper may be added straightaway to the topping bath.

For the production of brown shades, the *Diamine Fast Browns* which in their direct dyeings are very fast already to light, further the *Diamine Browns*, especially *Diamineral Brown G*, *Diamine Brown 3G* and *R*, *Diamine Catechine B*, *G*, *3G* are used principally, and the fastness to light and washing of the latter is increased by an aftertreatment with bichrome and copper sulphate.

For *Green*, the various *Diamine Greens*, *Diamine Dark Green N*, or combinations of *Diamine Fast Blue* and *Diamine Fast Yellow*, dyed direct, or *Diamine Blue RW* or *Diamine Sky Blue FF* in combination with *Diamine Fast Yellow*, and aftertreated with copper sulphate, are coming into consideration.

For *Black*, on cheap goods, mostly *Oxy Diamine Black JE*, *JB* and *JW* are used; for better-class articles, *Diamine Jet Black* or *Diamine Fast Black*, likewise *Diaminogene B*, diazotised and developed with Phenylene Diamine or Resorcline.

Immedial Colours.

Immedial Colours are likewise used largely for linen and half-linen, and are dyed according to the general directions for cotton; the weights both of the dyestuff and salt are however reduced, the amount of sodium sulphide on the other hand being increased. Turkey-red oil or Monosolvol are added with a view principally to promote good levelling and penetration.

For the production of *blue shades*, the *Immedial Colours* are extensively used, particularly as substitutes for *Indigo*. The *Immedial Indone* and the *Immedial Indogene* brands are used for producing light shades; dark shades are dyed with *Immedial Direct Blue* shaded with *Immedial Indone*, or with *Immedial Blue* in combination with *Immedial New Blue*, the latter developed by steaming or smothering, or with *Immedial Developer*. If the demands for resistance to washing are very exacting, such dyeings should be treated with copper sulphate and bichrome.

Basic Colours such as *Naphtindone*, *New Methylene Blue*, *Methyl Violet*, serve for shading; these dyestuffs may also be added to the finishing size.

For *Brown*, the *Immedial Cutch* and *Immedial Brown* brands are used, saddened if necessary with *Immedial Dark Brown* or *Immedial Black*.

For *Green*, the various *Immedial Greens*, *Immedial Brilliant Green G extra* and *Immedial Deep Green G*, saddened with *Immedial Dark Green*, are used.

For *Black*, any of the *Immedial Blacks* may be used if particularly good fastness is required. For dyeing linen and half-linen goods, *Immedial Black NG*, *NNG conc.*, *Immedial Brilliant Carbon FG* and *Immedial Carbon B* are given the preference.

Examples.

Indigo blue (medium) shades for 100 lbs of *linen yarn* in about 200 gallons liquor:

Starting bath: Subsequent bath:

5.6 lbs	4 lbs	<i>Immedial Indogene GCL conc.</i>
2.4 „	2 „	<i>Immedial Direct Blue B</i>
15 „	8 „	sodium sulphide crystals
6 „	0.6 „	soda ash
10 „	1 „	desiccated Glauber's salt.

Dye the previously well boiled yarn for 1 hour at boiling temperature, on bent sticks, squeeze off, rinse, expose for a few hours to the air, and dry.

Dark blue for 130 lbs of *linen cloth*, 220 yards, in about 200 gallons liquor, dyed in a jigger with the batch rollers submersed in the liquor:

(Proportions for the standing bath):

6½ lbs	<i>Immedial Indone RG conc.</i>
4 „	<i>Immedial Direct Blue JB</i>
20 „	sodium sulphide crystals
¾ „	soda ash
1¼ „	glucose
1 „	Turkey-red oil.

Dissolve the dyestuff together with all the ingredients in about 12 gallons of the boiling liquor, and add this solution in two portions to the dyebath; enter the dry goods (not boiled off), and dye for 1½ to 2 hours, squeeze off very thoroughly by means of the squeezing rollers, and give an air passage for about 20 yards over some guiding rollers. Then give a passage through cold water and

rinse thoroughly in the jigger, first in cold and then in hot water. Aftertreat finally in a fresh, boiling hot bath charged with $\frac{1}{2}\%$ bichrome, 2% copper sulphate and 5% acetic acid, then rinse.

HYDRON COLOURS.

Blues of particularly good fastness to light, washing and bleaching are obtained with *Hydron Blue*, which is dyed in the same way as on cotton. It is an advantage to add some Turkey-red oil or Monosolvol to the dyebath. Somewhat less dyestuff is required than for cotton.

For material difficult to penetrate, it is well to commence dyeing at a moderate temperature, and then gradually to increase the temperature to 70—80° C. (160—175° F.).

Linen and half-linen piece-goods are dyed principally in the ordinary jigger provided with squeezing rollers and arrangements for oxidising, in the same manner and with the same additions as in the case of cotton piece-goods as given on page 244, except that the amount of dyestuff may be reduced by about one-third.

In order to attain good penetration, the duration of the dyeing should be prolonged a little, and in such case it is advisable also to dye in a jigger with the batch rollers submersed in the liquor.

Dark Blue on 150 lbs unbleached linen, 80 gallons liquor.

The goods, previously well boiled, are dyed as follows:

Starting bath: Subsequent bath:

18 lbs	14 lbs	Hydron Blue G Paste 20%.
4½ „	3½ „	Hydron Blue R paste 20%.
15 „	10½ „	Hydrosulphite conc. powder
15 „	8 „	Caustic soda lye of 77° Tw.
2 quarts	1¼ quarts	Turkey-red oil or Monosolvol.

After dyeing, squeeze off, pass through the air over some guiding rollers in order to oxidise, (abt. 20 yards), and rinse thoroughly.

BASIC COLOURS.

These are dyed on linen on a mordant; the directions on the whole are the same as stated for cotton. Mordanting in this case however requires smaller quantities of tannin and antimony, and the mordanting process should be prolonged and carried out at a somewhat higher temperature. When dyeing material so treated, the quantity of acetic acid, and for instance with Naphtindone that of alum or sulphate of alumina, should be increased. (See pages 47—51 and 71.)

Basic dyestuffs are extensively used for *topping Diamine, Immedial or Hydron Colours*, and to this end are dyed in a fresh bath, from cold to hot, with the addition of acetic acid or alum; mordanting is unnecessary in this case (page 71).

DYEING OF CHINA-GRASS.

China-grass resembles cotton in its behaviour in dyeing, and the instructions given for cotton are therefore applicable for China-grass also. Pure white material is usually dyed which need not be bleached; it is sufficient to merely wet it in a hot soda solution before dyeing.

DYEING OF KAPOK.

For dyeing Kapok, Diamine, Immedial, Hydron or Basic Colours are suited; Basic Colours may be dyed on this material without mordanting previously. It has to be noted in dyeing with Diamine and Immedial Colours that the amount of soda should be as small as possible, the gloss of the fibre being affected by alkalies. On the other hand, double the amount of salt should be added as for cotton, because Kapok does not absorb dyestuffs so readily as cotton. On an average 40—50% more dyestuff is required than for dyeing the same depth of shade on cotton.

Kapok, before dyeing, is simply boiled in plain water; when dyeing light shades, it is best to bleach the goods without previously boiling with alkalies. The bleaching is carried out for preference with hypochlorite of soda of $\frac{3}{4}^0$ Tw.

All the Immedial, Hydron and Basic Colours are equally well suited for dyeing Kapok.

Of the Diamine Colours, the following are the most suitable:

- Diamine Fast Yellow, all brands
- Diamine Fast Blue FFB
- Diamine Fast Orange ER, EG
- Diamine Fast Brown R, G
- Oxy Diamine Yellow TZ
- Diamine Red 4B
- Diamine Scarlet 3B
- Diamine Brilliant Bordeaux R
- Diamine Brown GG, 3G
- Diamine Sky Blue FF
- Diamine Green CL
- Diamine Black BH

Diamine Nitrazol Green GF	} coupled with Nitrazol C
Diamine Nitrazol Brown T	
Diaminogene B	} diazotised and developed with Phenylene Diamine.
Oxy Diaminogene FFN	

The Basic Colours may be dyed on Kapok direct without any previous mordanting in a feebly acidified bath; if the requirements for fastness are exacting, the goods are mordanted previously with tannin and antimony salt in the customary manner same as for cotton.

Mixed Fabrics of Kapok and Cotton. On account of the difference in the affinity for dyestuffs of the two fibres, there are considerable difficulties in obtaining absolutely solid shades on mixed goods made of Kapok and cotton.

The most satisfactory results are obtained by passing the goods a few times through a cold bath of caustic soda lye of 18° Tw. on the jigger or padding machine. If not resorting to this treatment, the best results are obtained with Immedial Colours.

DYEING OF JUTE, COCOA-NUT FIBRE AND PIASSAVA.

While Piassava is dyed without any preparatory treatment, it is sufficient in most cases for jute and cocoa-nut fibre to soak these materials in boiling water or in a weak soda solution, subsequently souring off lightly with sulphuric acid. If jute is to be bleached, this is done either with potassium permanganate and sulphurous acid, or in a cold bath of hypochlorite of soda with a subsequent souring off in a weak hydrochloric or sulphuric acid bath.

The following dyestuffs may be used:

a) *Basic Colours*, are used for producing especially bright shades and also for browns, navies and blacks:

Yellow and Orange:

Thioflavine T, TCN
Para Phosphine GG, G, R
Diamond Phosphine D, GG, PG, R
New Phosphine G
Tannin Orange R
Chrysoïdine, all brands.

Red and Claret:

Safranine, all brands
 Tannin Heliotrope
 Magenta
 Cerise Ia. N
 Russian Red B. G
 Irisamine G (for Pink).

Blue and Navy:

New Methylene Blue N, R, 3R
 Indazine M
 New Blue B, R, D
 Navy Blue 010650J.

Green:

Brilliant Green crystals extra
 Solid Green crystals O.

Violet:

Methyl Violet, all brands
 Crystal Violet 10B.

Brown:

Bismarck Brown, all brands
 Tannin Brown B
 Piassava Brown KB.

Black:

Jute Black, all brands
 Tannin Leather Black M.

Dye without mordanting, cold to boiling, with the addition of 2—5% acetic acid; in the case of goods difficult to penetrate, this quantity may be increased to 10%.

b) Acid Colours for Mode Shades. Bright Scarlet, Yellow, Orange and Blue Shades.

Yellow and Orange:

Indian Yellow G, R
 Tropaecline OO
 Orange extra, EN
 Acid Brown D.

Red:

Cocoa-nut Scarlet OEE
Brilliant Croceïne, all brands
Roccelline.

Blue and Grey:

Pure Soluble Blue
Water Blue B, R, RS
Nigrosine soluble in water
Aniline Grey B, R
Solid Blue R, 3R.

Mode Shades:

Combinations of
Indian Yellow R
Orange EN
Acid Brown D
with
Solid Blue R or
Nigrosine soluble in water and
Brilliant Croceïne 3B.

Dye for one hour at the boil with the addition of about 5% alum and 10—20% Glauber's salt crystals, allowing to feed for another $\frac{1}{2}$ hour in the cooling bath; then dry without further rinsing.

c) *Diamine Colours.* For all kinds of shades, in particular for material difficult to penetrate and for dyeings which must be fast to rubbing.

Dye at the boil with the addition of $\frac{1}{2}$ —1% soda and 5—20% Glauber's salt crystals in as short a bath as possible; the baths do not exhaust, and are for preference kept for subsequent lots.

The following are particularly well suited:

Yellow and Orange:

Diamine Fast Yellow B, FF, M
Diamine Yellow CP
Diamine Orange B, F
Diamine Fast Orange EG, ER
Oxy Diamine Orange G, R.

Red and Claret:

Diamine Red 4B, 6B, 10B
 Diamine Purpurine B, 3B, 6B, V
 Diamine Violet Red
 Diamine Bordeaux B, S, BR, VRO
 Diamine Fast Bordeaux 6BS
 Diamine Brilliant Bordeaux R.

Blue:

Diamine Sky Blue, FF, FFN, FFS
 Diamine Pure Blue A
 Oxy Diamine Blue B, G, 3G, 5G
 Diamine Azo Blue No 51, 54
 Diamine Steel Blue L
 Diamine Fast Blue FFB
 Diamine Fast Brilliant Blue R
 Diamine Dark Blue B
 Diamine Black BH.

Green:

Diamine Green B, G, CL, FG
 Diamine Dark Green N.

Violet:

Diamine Violet N
 Diamine Fast Violet FFBN, FFRN
 Diamine Brilliant Violet B, RR
 Oxy Diamine Violet B, G, R.

Brown:

Diamine Brown 3G, M, R, MR
 Diamine Fast Brown G, R
 Oxy Diamine Brown G, RN, 3GN
 Diamine Catechine G, B
 Cotton Brown N
 Cotton Dark Brown BM.

Grey and Black:

Diamine Fast Grey BN
 Diamine Fast Black C high conc., CB high conc.
 Oxy Diamine Black JE, JB, JW, single and concen-
 trated brands.

DYEING OF FIBRE, SISAL AND MANILA HEMP.

These fibres are dyed either with *Diamine Colours*, or if especially bright shades are to be produced, with *Basic Colours*, the dyestuffs recommended for jute, coconut fibre and piassava being generally employed.

Owing to the high percentage of tannins which these fibres contain, it is necessary to add for Diamine Colours 0.25—0.5% soda and when dyeing in the standing bath also 1.5—2% ammonia of 10%.

The colour most in demand is black which is dyed with the Oxy Diamine Blacks AM, AT, JE, JB, JW, 700J, 552Z, and OJEG alone or in combination with logwood extract, according to the following methods:

Charge the starting bath with 2% ammonia and $\frac{1}{4}$ — $\frac{1}{2}$ % soda ash, add 2—3% dyestuff previously well dissolved in condensed water and then about 5% Glauber's salt crystals; boil up well, enter the material, work for 5 to 10 minutes, cover with a lattice frame weighted with stones, boil for $\frac{1}{2}$ to 1 hour, and allow to feed for $\frac{1}{4}$ to $\frac{1}{2}$ hour in the cooling bath; then lift the fibre, rinse, and dry.

When dyeing fibre materials to be used for the manufacture of brushes etc., and if a thorough penetration of the material is essential, it is best to use a combination of about 2—3% Oxy Diamine Black and 2—4% logwood extract.

Dye exactly as stated above, but boil for 2 to 3 hours according to the thickness of the fibre, and allow to feed for $\frac{1}{2}$ to 1 hour in the cooling bath. Then lift the material, leave it exposed to the air for several hours, and enter into a fresh bath heated to 30—40° C. (85—105° F.) containing pyrolignite of iron of 4—7° Tw.; leave in this bath for $\frac{1}{2}$ to 1 hour, lift, then expose to the air for several hours, rinse well, and dry.

If so-called patent or lustre-fibre is to be produced, the method of working is exactly as described above; only the fibre is finally taken through a bath of 40—50° C. (105—120° F.) charged as follows:

10 gallons	liquor	2 lbs	logwood extract
2 lbs	gelatine glue	$\frac{1}{2}$ lb	fustic extract
2 lbs	soft soap	$\frac{1}{2}$ lb	pyrolignite of iron.

Treat the goods in this bath for 30 minutes, allow to drain, and brush dry with suitable brushing machines. If the fibre is not lustred, 8 oz of chalk per 10 gallons liquor are added to the bath of pyrolignite of iron.

The dye liquors may be used repeatedly; dyeing in the standing bath requires about $\frac{1}{2}$ — $\frac{2}{3}$ of the stated quantities of dyestuff and logwood extract, equal quantities of soda and ammonia, and about 3% salt calculated on the weight of the goods.

SUPPLEMENT:

Water and the ordinary Chemicals.
Thermometer and Hydrometer Tables.
Weights and Measures.

WATER AND THE ORDINARY CHEMICALS.

WATER.

Water is one of the most important requirements in dyeing, and the results obtained are often entirely dependent on the condition and quality of the water used. It is most important therefore to see that the water used for dyeing is of good quality. The purer it is, that is to say, the less foreign matter it contains, the better it is adapted for dyeing purposes, and the more completely the dyestuffs and other ingredients of the bath are utilised.

A very pure quality of water is condensed water which in most dyeworks can be collected free from oil, and is excellently adapted for dyeing purposes, chiefly for dissolving the dyestuffs and charging the dyeing machines. Rain water may likewise be used to good advantage, and can easily be collected free from mechanical impurities. Water from ponds, provided it is free from mud, is very serviceable. Other waters, in the natural state, always contain more or less impurities dissolved, and frequently also mechanical impurities.

The impurities which are the most troublesome to the dyer are the sulphates and bicarbonates of lime and magnesia, sometimes also magnesium chloride, which, together with the iron compounds, cause the hardness of the water; the iron compounds are most obnoxious in bleaching. The impurities dissolved in the water have a deleterious effect in so far as they often precipitate dyestuffs, soaps, oils and mordants, and are thus apt to cause spots and other irregularities, not to mention the loss of dyestuff, soap, etc.

Iron, apart from its property to form brown precipitates, has the disadvantage of dulling the shades. This may also be said of mud, which soils the goods mechanically.

Water free from lime, magnesium or iron salts, or which contains slight quantities of these only, for instance condense water or rain water, is called soft water in contradistinction to hard water. The hardness of the water is expressed in degrees, and varies in the different countries.

1 English degree of hardness is equivalent to

1 part of calcium carbonate in 70 000 parts of water
or 1 grain of calcium carbonate (Ca CO_3) per gallon of water;

1 German degree of hardness is equivalent to

1 part of calcium oxide (Ca O) in 100 000 parts of water;

1 French degree of hardness is equivalent to

1 part of calcium carbonate (Ca CO_3) in 100 000 parts of water.

1° English corresponds therefore to 0.8° German or 1.43° French.

Hard water on boiling loses its hardness by separating the bicarbonates in the form of carbonates. This hardness is usually called *temporary hardness*, whereas the hardness not removed by boiling is called *permanent hardness*; the sum of the two is called the *total hardness*.

Whether the water is to be considered good or bad is dependent upon the use to which it is put, but at any rate no water should be used for dyeing which exceeds 23—25° (Engl.) in hardness. Water harder than this is particularly unsuited for machine-dyeing or for soaping or oiling.

If hard water only be available, it is well to soften it. For large daily consumption this is best done by means of one of the water-purifiers constructed by the different machine-works, in which the water is softened and purified by a constant inflow of lime and soda. Of late too, water is corrected by the Permutite process.

If so desired, we shall be pleased to give particulars for correcting the water in any special case.

At small establishments the purification may be done in large wooden vessels. For every degree of permanent hardness, about $2\frac{1}{2}$ oz soda ash are added to 1000 gallons of the water to be corrected; thus, with for instance a permanent hardness of 20°, about 3 lbs soda ash should be added for 1000 gallons. After boiling up well, the

water is left standing for a few hours, to allow the precipitate to settle, whereupon the clear water freed from the precipitate is used. It is best to work with two vats, the size of which depends upon the daily requirement; the precipitate of the boiled water thus may settle in the one vat, while the soft water in the other is being used. It is best to use only as much soda as will cause as slight an alkaline reaction as possible (red litmus paper should not become strongly blued, or only a small amount of acetic acid should be required for producing an acid reaction on blue litmus paper).

Water containing solid substances should best flow — before softening — through a pool or pond in which the greater portion of the mud collects at the bottom, the remainder settling along with the lime precipitate, on softening.

A slight excess of soda in the water will do no harm, when dyeing and dissolving Diamine, Immedial or Hydron Colours. On the other hand, such excess of soda should be carefully avoided, when dyeing with Basic Colours or when aftertreating with metallic salts. If such excess be present in the water, so that it reacts alkaline, it may easily be neutralised by slightly acidifying with acetic acid until blue litmus paper just begins to be reddened.

SULPHURIC ACID.

Sulphuric acid is a thick, oily liquid without any colour (rendered brownish sometimes through the presence of small amounts of organic substances).

For dyeing, the ordinary commercial sulphuric acid, so-called oil of vitriol or D.O.V. is commonly used, which should contain 93—98% pure sulphuric acid.

Fuming sulphuric acid contains sulphuric acid anhydride, and is no longer used in dye-houses.

Sulphuric acid absorbs water from the air with great avidity, and should therefore be kept in closed vessels. On mixing with water it evolves great heat. In order to avoid dangerous boiling up and spattering, sulphuric acid should always be diluted by being poured in a thin jet into a large quantity of cold water, stirring well all the time.

The water should not be hot, nor should water ever be added to undiluted acid. Sulphuric acid diluted with half its weight of water does not become heated again severely.

Sulphuric acid is sometimes used in place of hydrochloric acid for acidifying in bleaching and diazotising. As a rule, it will be found that 1 part by weight of sulphuric acid will take the place of 2—2½ parts by weight of hydrochloric acid.

The strength of sulphuric acid may be determined with the hydrometer according to the following table.

SULPHURIC ACID.

Specific Gravity at 15° C. (59° F.) (Lunge and Isler).

Degrees Twaddle	Per cent sul- phuric acid	Degrees Twaddle	Per cent sul- phuric acid	Degrees Twaddle	Per cent sul- phuric acid	Degrees Twaddle	Per cent sul- phuric acid
2	1.57	48	32.28	94	56.90	140	77.17
4	3.03	50	33.43	96	57.83	142	78.04
6	4.49	52	34.57	98	58.74	144	78.92
8	5.96	54	35.71	100	59.70	146	79.80
10	7.37	56	36.87	102	60.65	148	80.68
12	8.77	58	38.03	104	61.59	150	81.56
14	10.19	60	39.19	106	62.53	152	82.44
16	11.60	62	40.35	108	63.43	154	83.32
18	12.99	64	41.50	110	64.26	156	84.50
20	14.35	66	42.66	112	65.08	158	85.70
22	15.71	68	43.74	114	65.90	160	86.90
24	17.01	70	44.82	116	66.71	162	88.30
26	18.31	72	45.88	118	67.59	164	90.05
28	19.61	74	46.94	120	68.51	165	91.00
30	20.91	76	48.00	122	69.43	166	92.10
32	22.19	78	49.06	124	70.32	167	93.43
34	23.47	80	50.11	126	71.16	168	95.60
36	24.76	82	51.15	128	71.99	168.3*	97.70
38	26.04	84	52.15	130	72.82	168.1*	98.70
40	27.32	86	53.11	132	73.64	168*	99.20
42	28.58	88	54.07	134	74.51	167.7*	99.95
44	29.84	90	55.03	136	75.42		
46	31.11	92	55.97	138	76.30		

*) Sulphuric acid 97.70% has the highest specific gravity, whilst that of stronger acid is slightly lower.

HYDROCHLORIC ACID.

Hydrochloric or muriatic acid appears in commerce either as a colourless liquid or coloured greenish-yellow by traces of iron. The commercial acid usually has a specific gravity of 26—38° Tw., and is contaminated with iron, arsenic, sulphuric acid and organic substances; for dyeing it is usually sufficiently pure. For Paranitraniline Red it is advisable to use pure hydrochloric acid of 34—36° Tw.

Unlike sulphuric acid, hydrochloric acid forms a freely soluble lime-salt (calcium chloride) and is therefore to be preferred to sulphuric acid for souring off, with a view to removing lime salts.

In dyeing, hydrochloric acid is used for the greatest variety of purposes, amongst others for preparing the diazotising baths and for souring off in bleaching.

The strength of hydrochloric acid may be determined by twaddling according to the following table.

HYDROCHLORIC ACID.

Specific Gravity at 15° C. (59° F.) (Lunge and Marchlewski).

Degrees Twaddle	Per cent hydro- chloric acid	Degrees Twaddle	Per cent hydro- chloric acid	Degrees Twaddle	Per cent hydro- chloric acid	Degrees Twaddle	Per cent hydro- chloric acid
1	1.15	11	11.18	21	20.97	31	30.55
2	2.14	12	12.19	22	21.92	32	31.52
3	3.12	13	13.19	23	22.86	33	32.49
4	4.13	14	14.17	24	23.82	34	33.46
5	5.15	15	15.16	25	24.78	35	34.42
6	6.15	16	16.15	26	25.75	36	35.39
7	7.15	17	17.13	27	26.70	37	36.31
8	8.16	18	18.11	28	27.66	38	37.23
9	9.16	19	19.06	29	28.61	39	38.16
10	10.17	20	20.01	30	29.57	40	39.11

It will be noticed that each degree Twaddle indicates approximately 1 percent pure hydrochloric acid.

ACETIC ACID.

Acetic acid is obtained by the dry distillation of wood. The pure concentrated product solidifies at ordinary temperature forming crystals of ice-like appearance, and is therefore called *glacial acetic acid*. Owing to its high price, it is not used for dyeing purposes.

Commercial acetic acid is a colourless liquid usually containing 30—50% pure acetic acid. It generally contains from its preparation empyreumatic substances, and traces of mineral acids, or it may be adulterated by mineral acids. An admixture of the latter is liable to be especially injurious in acetic acid used for brightening or scrooping cotton goods, as the mineral acids are apt to tender the cotton on storing. For such purposes, only acetic acid warranted free from mineral acids should be used, whilst for most other purposes a slight admixture of mineral acids is of no consequence.

Acetic acid is used in cotton dyeing for acidifying the liquors for dyeing, mordanting and aftertreating, particularly also for neutralising the alkaline effect of soda and calcium carbonate in the aftertreatment with metallic salts and the dyeing with Basic Colours, and in order to cause the Basic Colours to dye more slowly and evenly. It is furthermore employed for scrooping mercerised cotton.

The hydrometer, while insufficient for determining exactly the strength of acetic acid, is used for approximately estimating its strength.

SPECIFIC GRAVITY OF ACETIC ACID AT 15° C. (59° F.)
(Oudemans).

Per cent acetic acid	Degrees Twaddle	Per cent acetic acid	Degrees Twaddle	Per cent acetic acid	Degrees Twaddle	Per cent acetic acid	Degrees Twaddle	Per cent acetic acid	Degrees Twaddle
5	1.3	25	7.0	45	11.4	65	14.3	85	14.8
10	2.8	30	8.2	50	12.3	70	14.7	90	14.3
15	4.3	35	9.4	55	13.1	75	14.9	95	13.2
20	5.7	40	10.5	60	13.7	80	15.0	100	11.1

The specific gravities above 11° Tw. correspond to two liquids of different strengths. To ascertain whether the acid contains more or less than 77% pure acetic acid, a small quantity of water should be added after measuring; if, on again measuring, a higher specific gravity is found, the acid contains more than 77%, otherwise less.

FORMIC ACID.

Formic acid is marketed in varying strengths, mostly in an 85% strength of excellent purity, but also in more diluted qualities. It is a very strong acid, considerably stronger in its action than acetic acid. Strong acid is very unpleasant in corroding the skin.

CHEMICALS.

SPECIFIC GRAVITY OF FORMIC ACID AT 20° C. (68° F.) (Richardson and Allaire).

Perc. by Weight	Perc. by Volume	Specific Gravity	Perc. by Weight	Perc. by Volume	Specific Gravity	Perc. by Weight	Perc. by Volume	Specific Gravity
Formic acid			Formic acid			Formic acid		
5	4.14	1.0116	40	35.90	1.0964	75	72.27	1.1170
10	8.40	1.0247	45	40.82	1.1086	80	77.67	1.1861
15	12.80	1.0371	50	45.88	1.1208	85	83.19	1.1954
20	17.17	1.0489	55	51.01	1.1321	90	88.74	1.2045
25	21.73	1.0610	60	56.13	1.1425	95	94.48	1.2141
30	26.37	1.0730	65	61.44	1.1544	100	100	1.2213
35	31.10	1.0848	70	66.80	1.1656			

LACTIC ACID.

Lactic Acid is marketed in the form of a brownish liquor with a peculiar odour. It is used generally in a strength of 50% and sometimes also of 80%. In cotton dyeing it is used principally for scrooping mercerised cotton, for which purpose it must be free from mineral acids.

TARTARIC ACID.

Tartaric acid is marketed in the form of large colourless crystals very easily soluble in water. In cotton dyeing it is used principally for scrooping mercerised cotton, for which purpose it must be free from mineral acids.

SODIUM HYDROXIDE OR CAUSTIC SODA. CAUSTIC SODA LYE.

Sodium hydroxide or caustic soda is marketed as a white molten mass in iron drums. It is very easily soluble in water, and deliquescent in the air, the resulting solution by absorbing carbon dioxide soon forming a hard mass of sodium carbonate. It has a very strong caustic effect and taste.

The usual market qualities contain 77—97% pure sodium hydroxide.

Caustic soda lye is an aqueous solution of caustic soda, and is bought for preference ready made in the case of favourable conditions of freight and transport, because the dissolving of caustic soda is very inconvenient.

Caustic soda lye, like sodium hydroxide, has a very strong caustic action. It should be particularly borne in mind that the smallest drop of even very dilute caustic soda lye is extremely dangerous to the eye.

Sodium hydroxide and caustic soda lye are used in the dyeing of cotton as an assistant in the dyeing of a good many colours; for instance of Hydron Colours, Immedial Blue, and in the dissolving of certain developers. They are very important also for the mercerising of cotton and the preparation of soap.

The strength of caustic soda lye is determined by means of the hydrometer at hand of the table given below. It has to be observed that the hydrometer does not indicate whether the goods contain soda, common salt or Glauber's salt, and how much of each of these products. Such impurities will cause the caustic soda lye to show too high a specific gravity.

SPECIFIC GRAVITY OF CAUSTIC SODA LYE AT 59° F.
(L u n g e).

Per cent Sodium Hydroxide	Degrees Twaddle	Per cent Sodium Hydroxide	Degrees Twaddle	Per cent Sodium Hydroxide	Degrees Twaddle
1	2.4	21	47.2	41	89.4
2	4.6	22	49.4	42	91.5
3	7.0	23	51.6	43	93.6
4	9.2	24	53.8	44	95.6
5	11.8	25	55.8	45	97.6
6	14.0	26	58.0	46	99.8
7	16.2	27	60.0	47	101.6
8	18.4	28	62.0	48	103.8
9	20.6	29	64.2	49	105.8
10	23.0	30	66.4	50	108.0
11	25.2	31	68.6	51	110.0
12	27.4	32	70.2	52	112.0
13	29.6	33	72.6	53	114.0
14	31.8	34	74.8	54	116.0
15	34.0	35	76.8	55	118.2
16	36.2	36	79.0	56	120.2
17	38.4	37	81.0	57	122.2
18	40.4	38	83.0	58	124.4
19	42.6	39	85.2	59	126.6
20	45.0	40	87.4	60	128.6

AMMONIA (LIQUOR AMMONIAE).

Ammonia represents the aqueous solution of ammonia gas which has a very pungent smell. It is marketed mostly in a strength of 24% (0.913 specific gravity), and is thus lighter than water.

Ammonia gas is driven out of the solution by heat, and escapes into the air by itself. The gas is sold in a condensed form as a chemically almost pure liquid in steel cylinders.

Ammonia has a strongly alkaline effect, and blues red litmus paper; it neutralises all acids and forms salts therewith. Its effect is milder than that of caustic soda lye, and it offers the great advantage that any excess easily volatilises, and consequently has no deleterious effect in many cases.

Ammonia is used for neutralising acids and for fixing mordants as well as for other purposes.

Its strength is usually determined by twaddling in accordance with the table given below.

SPECIFIC GRAVITY OF AMMONIA AT 15° C. (59° F.)

(Lunge and Wiernik).

Specific gravity at 59° F.	Per cent (gaseous) ammonia	Specific gravity at 59° F.	Per cent (gaseous) ammonia	Specific gravity at 59° F.	Per cent (gaseous) ammonia
1.000	0.00	0.960	9.91	0.920	21.75
0.995	1.15	0.955	11.34	0.915	23.36
0.990	2.31	0.950	12.74	0.910	24.99
0.985	3.55	0.945	14.22	0.905	26.65
0.980	4.80	0.940	15.63	0.900	28.33
0.975	6.05	0.935	17.12	0.895	30.03
0.970	7.31	0.930	18.64	0.890	31.75
0.965	8.59	0.925	20.18	0.885	33.68

SODIUM SULPHIDE.

Sodium sulphide is marketed in two qualities, viz, as crystallised and as concentrated sodium sulphide. Crystallised sodium sulphide consists of brownish crystals containing 32½% pure sodium sulphide and in addition water of crystallisation. The concentrated product has usually double the strength, and is sold in the form of grey or greyish black, irregular lumps.

Sodium sulphide is very freely soluble in cold or warm water. It absorbs moisture, carbon dioxide and oxygen from the air, liquefies, and becomes partially converted into sodium carbonate and sulphate. As it thereby loses in strength, it should be stored in closed receptacles and not be kept too long in stock.

Sodium sulphide is used for dissolving Sulphide Colours. Its application is described in the above.

For dyeing very light shades in apparatus, it is well to dissolve the Immedial Colours with clear sodium sulphide solution. The clear solution is prepared by dissolving the amount of sodium sulphide required for a day or two in a small quantity of hot water (about double the weight of the sodium sulphide), allowing this to stand and drawing off the clear solution from the sediment.

SODA OR SODA ASH, SODIUM CARBONATE OR CARBONATE OF SODA.

Soda is usually sold as a white powder (soda ash, Solvay or ammonia soda) or in the form of crystals (soda crystals, crystal carbonate). It is produced principally according to the older Leblanc process or the newer Solvay or ammonia process, nowadays also by electrolysis. Before the introduction of the Solvay process, Leblanc soda was often very impure, whereas Solvay soda apart from common salt cannot contain any soluble impurities over from the manufacture. Ammonia soda frequently preferred, is therefore but excellent Leblanc soda is likewise manufactured for years past.

Soda crystals is crystallised soda containing about 63% crystal water and small amounts of Glauber's salt but no deleterious impurities. It contains mostly about 36% pure sodium carbonate. Since soda ash of good quality is obtainable, soda crystals is not used much nowadays in dye-houses, as it is too expensive comparatively; the only advantages it possesses over good soda ash is that its strength is nearly always the same and that it dissolves quickly in water without forming lumps.

Crystal carbonate is likewise a pure crystallised soda containing however 18% water of crystallisation only.

Soda is stable on exposure to the air; soda ash is apt to form hard lumps in moist air, without absorbing any appreciable quantities of water. It has a caustic

taste and a milder alkaline effect than caustic soda. Most acids like sulphuric, hydrochloric and acetic acid neutralise soda with development of carbon dioxide; its solutions therefore effervesce on adding acids.

Soda dissolves most copiously in water of 32.5° C. (90° F.). 100 parts of water dissolve the following quantities of pure sodium carbonate at:

32	41	50	59	68	86	90 ¹ / ₂	93 and 174	212° F.
7.1	9.5	12.6	16.5	21.4	38.1	59	46.2	45.1 parts soda.

Soda ash is marketed in various degrees of strength, calculated on the supposed percentages of sodium oxide. Good qualities of soda ash contain 81%, 88—95% and 98%. Ammonia soda usually contains 98—99% sodium carbonate, and is sufficiently pure for all dyeing purposes.

Our indications regarding *soda ash* refer to the good qualities 95—98), of whatever manufacture they may be. 100 parts of good soda ash are approximately equivalent to 270 parts soda crystals.

The strength of pure soda solutions may be determined with the hydrometer, at hand of the following table. It has however to be observed that impurities like salt or Glauber's salt are not especially indicated.

SPECIFIC GRAVITY OF SODA SOLUTIONS AT 15° C. (59° F.)
(Lunge).

Degrees Twaddle	Per cent Sodium Carbonate	Degrees Twaddle	Per cent Sodium Carbonate	Degrees Twaddle	Per cent Sodium Carbonate
1	0.47	11	5.23	21	9.90
2	0.95	12	5.71	22	10.37
3	1.42	13	6.17	23	10.83
4	1.90	14	6.64	24	11.30
5	2.38	15	7.10	25	11.76
6	2.85	16	7.57	26	12.23
7	3.33	17	8.04	27	12.70
8	3.80	18	8.51	28	13.16
9	4.28	19	8.97	29	13.63
10	4.76	20	9.43	30	14.09

COMMON SALT, SODIUM CHLORIDE (ROCK SALT).

Common salt is made from rock salt, salt water, sea-water, etc. It crystallises without water of crystallisation, but ordinarily contains some moisture, and frequently also

some sodium sulphate, calcium sulphate or magnesium chloride. The solubility of common salt is about the same at any temperature, and varies only between 35.5 parts common salt at 0° C. (32° F.) up to 39.2 parts at 100° C. (212° F.), in 100 parts of water. The specific gravity of aqueous solutions at 15° C. (59° F.) according to Gerlach is as follows:

Percent common salt:	5	10	15	20	25	26.4 saturated
Specific gravity:	1.0362	1.0733	1.1114	1.1510	1.1923	1.2043
Degrees Twaddle:	7.2	14.7	22.3	30.2	38.5	40.9

Common salt is used in cotton dyeing for the same purposes as Glauber's salt. As the coarser kinds of common salt used in dyeing frequently contain small amounts of magnesium chloride, it is better to use crystallised Glauber's salt in machine-dyeing; otherwise, however, common salt may almost invariably be used in place of crystallised or desiccated Glauber's salt.

GLAUBER'S SALT, SODIUM SULPHATE OR SULPHATE OF SODA.

Glauber's salt is used in the form of crystals, or desiccated Glauber's salt (sodium sulphate). The desiccated product may contain various impurities, especially an excess of sulphuric acid. The crystallised salt is generally of a fairly pure quality, and contains, if chemically pure, 44.1% anhydrous salt and 55.9% water. It effloresces in the air and is easily soluble in water. 100 parts desiccated Glauber's salt are equivalent to about 220 parts Glauber's salt crystals.

100 parts of water dissolve at:

32°	50°	59°	68°	77°	86°	91½°	104°	217½° F.	
5	9	13	19	28	40	50	49	42.6	parts of desiccated Glauber's salt.

Glauber's salt should not be acid (must not redden blue litmus paper), because Diamine and Immedial Colours are precipitated by acids. When dyeing in mechanical apparatus, special care must be taken that the Glauber's salt used is entirely soluble, and crystallised Glauber's salt should therefore be given the preference in machine-dyeing.

SPECIFIC GRAVITY OF AQUEOUS SOLUTIONS AT 15° C. (59° F.).

Per cent calc. Glauber's salt	Specific Gravity	Per cent calc. Glauber's salt	Specific Gravity	Per cent calc. Glauber's salt	Specific Gravity
1	1.0091	5	1.0457	9	1.0832
2	1.0182	6	1.0550	10	1.0927
3	1.0274	7	1.0644	11	1.1025
4	1.0365	8	1.0737	12	1.1117
					saturated.

The percentages of crystallised Glauber's salt are found by multiplying the above percentages by $2\frac{1}{4}$.

SODIUM NITRITE OR NITRITE OF SODA. NITRITE.

Sodium Nitrite forms small crystals freely soluble, but not deliquescent in the air, and containing 95—98% nitrite.

It is used in cotton dyeing for diazotising dyestuffs to be developed, and also for diazotising Paranitraniline; its action is based on the liberation of nitrous acid on the addition of mineral acids, such as hydrochloric or sulphuric acid; acetic acid has not the same effect. For 1 part of nitrite, 3 parts of hydrochloric acid 32° Tw. or 2 parts of sulphuric acid are used.

SODIUM ACETATE OR ACETATE OF SODA.

This salt forms very readily soluble crystals. It serves for neutralising free mineral acids, forming their salts and liberating free acetic acid. It is used for instance in the coupling and also in the developing of Paranitraniline Red, i. e. in the preparation of the solution of the diazotised Paranitraniline or of Nitrazol. For union goods which have been cross-dyed in an acid bath, a final impregnation with acetate of soda is very useful for preserving the strength of the cotton fibre, and an addition of acetate of soda to the last bath used for rinsing cotton goods dyed with Immedial Black is always advisable.

SODIUM FORMATE OR FORMATE OF SODA

possesses similar properties, and is used for the same purposes, as acetate of soda. It is marketed in a very pure quality.

SODIUM PHOSPHATE OR PHOSPHATE OF SODA.

This salt forms crystals which effloresce in the air, and are soluble in 25 times their weight of cold water, or in their own weight of boiling water. Phosphate of soda is a mild alkaline salt sometimes used in place of Glauber's salt for dyeing Diamine Colours in light shades.

BORAX, SODIUM BI-BORATE OR BI-BORATE OF SODA.

White crystals containing water of crystallisation, or a white anhydrous powder, moderately soluble in water. Feebly alkaline salt, sometimes used in place of soda, phosphate of soda, etc. It is further used for rendering cotton goods incombustible.

SODIUM PERBORATE OR PERBORATE OF SODA.

Sodium perborate or perborate of soda, *perborate* for short, is a white powder very sparingly soluble in water, which contains in its pure state 10% active oxygen. More recently it is manufactured also in crystalline form. It reacts alkaline, and on being heated emits oxygen, thus exercising a strong bleaching action similarly to hydrogen peroxide. On this account it is recommended as a bleaching agent in substitution for hydrogen or sodium peroxide, and also as an addition to washing powders. It has the advantage over the former of excellent stability, and over the latter of safety in its application, which is also easier, because the product is simply put into the aqueous bath without the addition of acid.

Dyeings of Hydron Blue gain considerably in brightness by an aftertreatment with perborate.

On becoming moist or when in an impure state, perborate very soon loses hydrogen.

**SODIUM SILICATE OR SILICATE OF SODA,
SOLUBLE GLASS.**

Silicate of soda as a rule is marketed as a colourless or slightly tinted glassy mass or as a thick aqueous solution frequently containing an excess of caustic soda deriving from its manufacture. It is very easily soluble in water, but not deliquescent; the solution decomposes, particularly under the influence of the carbonic acid from the air, and separates silicic acid. Silicate of soda is used also as an alkaline salt, particularly for the fixing of mordants. It is largely employed for fire-proofing and water-proofing textile materials.

SODIUM TUNGSTATE OR TUNGSTATE OF SODA.

White crystals easily soluble in 4 parts of cold, or 2 parts of hot water. A weakly alkaline salt. Used less in dyeing than for fire-proofing and for producing so-called "Opaline" effects.

SODIUM CHLORATE OR CHLORATE OF SODA.

Colourless crystals which dissolve in their own weight of cold water, and half their weight of hot water, thus dissolving much more readily than the corresponding potassium salt. On the whole the two salts possess the same properties. Sodium chloride is a strong oxydising agent which in cotton dyeing is used principally in the production of Aniline Oxidation Black and for discharging purposes.

SODIUM BISULPHITE OR BISULPHITE OF SODA.

This product is usually marketed under the denomination of metasulphite or pyrosulphite, in the form of white crystals which decompose with the evolution of heat on exposure to the air.

In the dye-house the aqueous solution of sodium bisulphite is used almost exclusively, which is either colourless or stained slightly yellowish by traces of iron, and smelling of sulphurous acid, generally containing 22—23% sulphurous acid and showing a specific gravity of about 64° Tw. Bisulphite was formerly used principally for preparing hydrosulphite solution for vat dyeing, but has now been substituted there by the solid Hydrosulphite conc. powder, which offers the advantage over the solution of good stability (see below). It is sometimes also used in order to remove hypochlorous acid from the bleached materials.

HYDROSULPHITE CONC. POWDER.

SODIUM HYDROSULPHITE OR HYDROSULPHITE OF SODA.

Sodium Hydrosulphite, which we deliver as *Hydrosulphite conc. powder*, keeps well in the solid state contrary to its solution if protected against moisture. In moist air, and particularly in aqueous solution, it is very apt to oxidise, and it should therefore be kept dry in a closed receptacle. It dissolves very easily in water. Solutions should not be kept on stock, but should be prepared for each case immediately before use.

Hydrosulphite is a very powerful reducing agent and is used chiefly for dissolving and dyeing Hydron Colours and other Vat Colours. As it has a destructive effect on a good many colours, it may be used also for stripping the colour off dyed materials.

SODIUM THIOSULPHATE, HYPOSULPHITE OF SODA, ANTICHLOR.

Sodium thiosulphate is a very easily soluble, well crystallising salt. Acid decomposes it, separating sulphur and sulphurous acid. It is used frequently for rendering hypochlorous acid (chlorine) innocuous in bleached materials.

CALCIUM CHLORIDE.

This is a very easily soluble salt which is formed by the action of hydrochloric acid on lime and chalk and is obtained as a waste product in many chemical processes. It is sometimes used as a substitute for magnesium chloride in finishing, because it does not split off any hydrochloric acid at elevated temperatures.

BARIUM CHLORIDE.

Colourless crystals which dissolve in three times their weight of cold water and still more easily in hot water. Barium chloride is poisonous. It is sometimes used for weighting cotton.

MAGNESIUM CHLORIDE.

Very easily soluble and deliquescent crystals which decompose on heating in the presence of moisture, generating hydrochloric acid. It is used as an addition to cotton dressings and sizings to protect the goods from becoming mouldy, and for weighting. In hot finishing on the calendar, magnesium chloride — as indicated above — is likely to generate hydrochloric acid and thus affect the goods; on this account, magnesium chloride is not always safe to use and is sometimes replaced by calcium chloride or Epsom salts.

EPSOM SALT, MAGNESIUM SULPHATE OR SULPHATE OF MAGNESIA.

Epsom salt is an easily soluble salt which is marketed in the form of crystals or a crystalline powder. It is sometimes used as an addition for sizing, when magnesium chloride, on account of the risk of tendering the fibre, cannot be used (see previous page); it must therefore be free from any magnesium chloride.

ALUM.

Commercial alum is sold either as potash alum or as ammonia alum, which show practically no difference in their properties. It is used in the dyeing of Basic Colours in order to retard their absorption and thus effect more even dyeings, and also in the dyeing of Acid Colours to fix them better on the fibre.

100 parts of water dissolve at:

50°	68°	86°	104°	158°	212° F.	
9.5	15.1	22.0	30.9	90.7	357.5 parts	potash alum
9.1	13.6	19.3	27.3	72.0	421.9 parts	ammonia alum.

ALUMINIUM SULPHATE OR SULPHATE OF ALUMINA.

Aluminium Sulphate has the same properties as alum, but is stronger than the latter, 100 parts of aluminium sulphate being equivalent to 140—150 parts of alum; it is very easily soluble in water. Aluminium sulphate sometimes contains an excess of sulphuric acid or small amounts of oxide of iron and Glauber's salt; it usually contains 50% pure aluminium sulphate, sometimes even more than 55%.

ALUMINIUM ACETATE OR ACETATE OF ALUMINA.

This is known only in form of its aqueous solution, and is usually prepared by mixing aluminium sulphate with lead acetate (sugar of lead) or calcium acetate; for instance, 171 parts sugar of lead are used per 100 parts of aluminium sulphate, the two being mixed together in aqueous solution and allowed to settle, whereupon the clear solution is drawn off for use. In order to free the solution entirely from lead, a small amount of Glauber's salt in solution may be added subsequently.

CHROME ALUM.

Chrome alum is obtained as a waste product in various chemical manufactures; it forms dark crystals which in spite of their beautiful, crystalline form may contain a great many impurities, more particularly calcium sulphate, tarry and other organic substances, and free sulphuric acid.

1 part of chrome alum dissolves in 7 parts cold or 2 parts boiling water. Chrome alum is frequently used for fixing Diamine Colours and Immedial Black, in the case of the latter principally in order to obtain a more greenish shade than can be obtained with bichrome.

CHROMIUM FLUORIDE.

Chromium fluoride is a green crystalline powder readily soluble in both cold and hot water, and has a corroding effect on glass and most metals.

It is used principally for aftertreating certain Diamine Colours such as Diamine Green G in order to fix them fast to washing.

CHROMIUM ACETATE OR ACETATE OF CHROME

is produced by dissolving chromium hydroxide in acetic acid or by the double decomposition of chrome alum with sugar of lead; it serves principally for fixing dyestuffs in calico printing. Chromium acetate is very readily soluble in water.

POTASSIUM BICHROMATE, RED CHROMATE OR BICHROMATE OF POTASH. BICHROME CHROME.

Potassium bichromate crystallises in large yellowish red crystals which are stable in the air and contain no water of crystallisation. 100 parts of water dissolve at:

32°	50°	104°	176°	212° F.	
5	8.5	29.4	73	172	parts potassium bichromate.

The commercial product is practically chemically pure.

Bichrome is used in cotton dyeing for aftertreating the Diamine, Immedial, and Hydron Colours.

SODIUM BICHROMATE OR BICHROMATE OF SODA. BICHROME. CHROME.

Sodium bichromate, contrary to potassium bichromate, forms deliquescent crystals containing water of crystallisation, and is much more soluble and cheaper than the potassium salt, for which reason it is frequently used in place of the former.

It is usually marketed in a strength equal to that of potassium bichromate, but not always in the same purity.

100 parts of water dissolve at

32°	59°	86°	176°	212°	F.
107	109	127	143	163	parts sodium bichromate.

Sodium bichromate is applied in exactly the same manner as potassium bichromate, and has the same effect.

COPPERAS OR GREEN VITRIOL. FERROUS SULPHATE.

Copperas is obtained by dissolving iron in dilute sulphuric acid, and on a large scale from iron pyrites. It forms bluish green crystals which easily decompose when exposed to the air and become brownish by oxidation. It is easily soluble in water, but oxidises quickly through the action of the air, separating red ferric hydrate.

In cotton dyeing copperas is used principally for preparing the copperas vat, and for fixing tannins and wood colours.

PYROLIGNITE OF IRON. IRON LIQUOR OR BLACK LIQUOR.

This is a dark olive brown liquid with a peculiar smell. The commercial product usually has a specific gravity of 20—30° Tw.; it is sometimes used in place of copperas for fixing the tannins in dyeing Basic Colours.

NITRATE OF IRON. FERRIC SULPHATE.

Nitrate of iron derives its name from being prepared by the oxidation of ferrous sulphate by means of nitric acid; it is however not a nitrate, but a sulphate, and is marketed as an aqueous solution of about 80° Tw. It is sometimes used, in place of copperas, for fixing the tannins in dyeing Basic Colours, and for producing buff shades.

TIN CRYSTALS OR TIN SALT. STANNOUS CHLORIDE.

Tin crystals are obtained by dissolving tin in hot hydrochloric acid. They dissolve completely in one-third their weight of water; the pure solution is rendered turbid when being diluted, through the separation of salt, but on adding hydrochloric acid it becomes clear again.

Tin crystals are used very largely for discharging Diamine Colours.

STANNIC CHLORIDE (PINK SALT).

This is generally used in form of solutions or as a double salt with ammonium chloride under the name of pink salt. It is exceedingly soluble in water and is used for fixing tannins for Basic Colours, which yield on a mordant of tannic acid and stannic oxide just as fast colours as on tannic acid and antimony.

ZINC SULPHATE OR SULPHATE OF ZINC. WHITE VITRIOL.

Dissolves very freely in water, and is sometimes used as an addition to the size and finish for cotton goods.

ZINC CHLORIDE.

Zinc chloride is very easily soluble and deliquescent; it is likewise used as an addition for finishing sizes, and acts as an antiseptic.

ZINC ACETATE OR ACETATE OF ZINC.

Zinc acetate consists of very soluble crystals, which have been recommended instead of tartar emetic for fixing tannins as mordants for Basic Colours. It is used best in the form of a solution obtained by adding 8—10 parts sulphate of zinc and 45 parts acetate of soda per 100 parts water.

COPPER SULPHATE, CUPRIC SULPHATE OR SULPHATE OF COPPER. BLUESTONE OR BLUE VITRIOL.

Blue Vitriol forms blue transparent crystals fairly soluble in water.

100 parts water dissolve at

50°	68°	86°	122°	158°	194°	212°	F.
37	42	49	66	95	156	203	parts blue vitriol.

Bluestone is extensively used for the aftertreatment of Diamine, Immedial and Hydron Colours, sometimes alone, and then again together with potassium or sodium bichromate; for Immedial Colours it should always be used in combination with a bichromate.

When using copper sulphate for the aftertreatment, the baths must not be turbid; this may easily be avoided by adding a sufficient amount of acetic acid. Copper sulphate improves to a very high degree the fastness to light of many colours (not however of all colours).

NICKEL SULPHATE OR SULPHATE OF NICKEL

forms green crystals which are very freely soluble, and may be used in the place of copper sulphate for the aftertreatment of some of the Diamine and Immedial Colours; see pages 12 and 35. Especially when applied according to our British patent No. 17267⁰⁸ as a substitute for copper sulphate in the aftertreatment of Immedial Colours in iron apparatus it is of great value because copper salts cannot be used in iron vessels on account of their action on the iron.

COBALTOUS ACETATE OR ACETATE OF COBALT

consists of violet crystals which are very freely soluble, and may be applied for the same purposes as nickel sulphate: (see above).

TARTAR EMETIC.

Tartar emetic, a double tartrate of antimony and potassium, is a crystalline salt not very soluble in cold water, but more so in hot water. One part of tartar emetic requires for dissolving at

48°	70°	88°	122°	167° F.
19	12.6	8.2	5.5	3.2 parts of water.

Tartar emetic is used for fixing tannic acid in the dyeing of Basic Colours.

The corresponding sodium salt of tartar emetic, on account of its much greater solubility, is given the preference for printing purposes.

The effective substance of tartar emetic is the antimony oxide, of which 43.4% are contained in the pure salt. The commercial product consists either of fine crystals or irregular pieces containing 43% antimony

oxide; tartar emetic, adulterated with cheaper antimony salts or entirely valueless substances, is also frequently met with in the market.

Tartar emetic and the other antimony salts are poisonous, but there is no risk of poison if the goods are tolerably well rinsed, after mordanting, as has been proved by many years' experience.

The valuation of tartar emetic and other antimony salts is based on the amount of antimony which they contain, and this can only be determined by an exact analysis.

SUBSTITUTES FOR TARTAR EMETIC.

Tartar emetic is relatively expensive on account of the high cost of tartar used in its manufacture, and has been replaced successfully by cheaper antimony salts. Some double salts of antimony fluoride, antimony oxalate and antimonine are the substitutes most in use.

Antimony salt, a double salt of antimony fluoride and ammonium sulphate (of E. de Haen) forms white crystals, of which 140 parts dissolve in 100 parts water. The solution reacts strongly acid and corrodes glass and metals. Antimony salt contains 47% antimony oxide, and 9 parts antimony salt correspond to nearly 10 parts tartar emetic.

Patent salt, double antimony fluoride or antimony sodium fluoride (of R. Koepp & Co.) is a very easily soluble, crystalline salt, and also corrodes glass and metals. It contains 66% antimony oxide, 65.8 parts double antimony fluoride thus corresponding to 100 parts tartar emetic.

In addition to these two products there are a number of other double salts of antimony fluoride in use.

About 5—20 parts of these salts are dissolved in 1000 parts of water, and as they are very strongly acid, about 6—8% of soda ash, reckoned on their weight, are added, just enough to render the bath slightly turbid.

Antimony oxalate or antimony potassium oxalate, which was introduced as the first cheap substitute for tartar emetic, was very satisfactory, but has now been replaced more by the double fluorides. In water it forms very readily soluble crystals, and quickly dissociates into insoluble basic antimony oxalate and soluble acid oxalate. It contains only about 25.1% antimony oxide as compared to 43.4% contained in tartar emetic; but it is said to be able to take the place of equal quantities of the latter.

Antimonine or Antimonyl Calcium Bilactate (C. H. Böhlinger Sohn, Ingelheim a. Rh.) is marketed containing 15% antimony oxide. It is crystalline, hygroscopic, and very freely soluble, and is to be used like the other substitutes for tartar emetic, but in a feebly acid solution of 2 gallons acetic acid per 1000 gallons liquor. The product is fairly much in use.

BLEACHING POWDER OR CHLORIDE OF LIME. CALCIUM HYPOCHLORITE.

Chloride of lime is a white powder smelling of chlorine, which should be free from any lumps. On exposure to the air, it absorbs moisture and carbon dioxide, forming then a doughy mass. Mixed with a little water, it evolves heat, and dissolves in 20 times its weight of water, a considerable residue always remaining. Chloride of lime should contain 35 to 39% active chlorine. It decomposes gradually, when stored; the decomposition may even take the character of an explosion.

For preparing a solution, 1 part of bleaching powder is mixed to a perfectly smooth paste with 3 parts of water and diluted with 3 parts more of water; after settling, the pure solution is diluted to the desired strength.

Chloride of lime is used for bleaching purposes; it should always be used in a perfectly clear solution, because any particles remaining undissolved and settling on the goods will tender them.

In order to increase the effect of chloride of lime, the chlored goods are exposed to the air so that the carbon dioxide of the air may bring about the full effect of the hypochlorous acid. The goods are further weakly soured off. After the treatment with chloride of lime or after the souring off, the goods should always be thoroughly rinsed, if necessary with the addition of an antichlor, such as sodium thiosulphate or bisulphite.

Hypochlorites and bleaching solutions (which contain hypochlorites) are determined in exactly the same manner as chloride of lime.

The following method of testing the hypochlorite liquors in the bleach-house has been proposed by R. Baur: For the titration of the bleaching liquors in use, a "thiosulphate" burette graduated into $\frac{1}{5}$ c.c. and a "chlorine tube" are required. The latter is a glass tube

of about $1\frac{1}{2}$ cm. ($\frac{3}{5}$ inch) width and 50 cm. (20 inches) length, closed at one end. Hydrochloric acid, potassium iodide and a thiosulphate solution containing 6.95 grms. sodium thiosulphate in 1 litre water are used for testing. This solution, each c.c. of which corresponds to 1 mg. (0.001 gram.) of active chlorine, is filled into the "thiosulphate burette". The "chlorine tube" is filled with 10 c.c. of the old chlorine liquor from the bleach-house, and a few c.c. of a solution of potassium iodide are added until, on gently shaking, the liquor no longer becomes brown or turbid. When this point has been reached, a few c.c. of hydrochloric acid are added, until the turbid liquor has become quite clear (brown). The thiosulphate solution is now added, pretty quickly at first and then drop by drop, until the colour, which on moderate shaking had gradually turned a paler yellow, suddenly disappears. Each c.c. of sodium thiosulphate solution added indicates 1 mg. (0.001 gram.) of active chlorine in 10 c.c. of bleaching liquor.

SODIUM HYPOCHLORITE. HYPOCHLORITE OF SODA. EAU DE JAVELLE.

Sodium hypochlorite is known only in the form of its aqueous solution, which is produced either by the electrolysis of common salt or by mixing chloride of lime and soda.

100 lbs of chloride of lime 33% are mixed with 40 gallons of water, and 60 lbs of soda ash are dissolved in 20 gallons of boiling water and diluted with 10 gallons of cold water. The soda solution is added to the paste of chloride of lime, and the mixture stirred for $\frac{1}{2}$ hour, and allowed to settle overnight. The clear solution is drawn off and the precipitate washed 4 or 5 times with cold water, the wash water being used to dilute the solution to about 150 gallons of 6—7° Tw. It may be freed entirely from lime by the addition of 1—2 lbs soda ash.

Hypochlorite of soda, like chloride of lime, is used for bleaching cotton goods of every description. As compared with chloride of lime, it offers the advantage that it can be easily obtained in a clear solution free from lime.

HYDROGEN PEROXIDE OR PEROXIDE OF HYDROGEN.

Hydrogen peroxide is used as a colourless aqueous solution prepared by the action of dilute sulphuric acid on barium peroxide, or sometimes sodium peroxide. The

action of hydrogen peroxide is based on its property of readily developing oxygen, and it is therefore used for bleaching. The strength of the commercial solution is usually expressed in volumes of oxygen evolved by 1 volume of the liquid, the usual strength of 12 volumes corresponding to 3% hydrogen peroxide.

The product keeps best at a low temperature, in the dark and if acidulated with small quantities of acid. An addition of 1½ oz naphthalene or 1 pint of alcohol or ether to 10 gallons of the solution improves its stability. In the presence of alkalies or on heating, it readily gives off the oxygen it contains, and as certain metals have a decomposing effect on hydrogen peroxide, it is best to keep it in well-tarred casks or in carboys.

Hydrogen peroxide is used for bleaching white yarns and fabrics and may also be used for developing Immedial Blue, for which purpose our Immedial Developer (page 37) is however considerably better suited.

SODIUM PEROXIDE

is a white deliquescent powder which absorbs carbon dioxide with the evolution of oxygen. It dissolves in water with generation of heat, and on boiling develops oxygen. On sufficiently cooling, it dissolves in acidulated water with formation of hydrogen peroxide and the corresponding sodium salt. It is frequently employed therefore in place of the latter for bleaching. When brought into contact with inflammable substances, like paper etc., it ignites them, and as moreover it is apt to decompose with a detonation without any apparent cause, it should be handled with care.

It is used sometimes for cotton bleaching, and also for developing Immedial Blue.

Sodium peroxide develops 20 per cent by weight of oxygen, whereas hydrogen peroxide of 12 per cent by volume only yields 1½ per cent by weight of oxygen. In addition, sodium peroxide possesses the advantage of remaining stable for an indefinite period when properly stored.

POTASSIUM PERMANGANATE OR PERMANGANATE OF POTASH.

Brilliant steel-blue, well-nigh black, crystals which dissolve in 15 to 16 times their weight of cold water, with an intensely blue-red colour.

Permanganate of potash is a very strong oxidising agent, and for this reasons is applied sometimes also for bleaching purposes; the brown precipitate of manganese peroxide which forms on the goods is very easily dissolved and removed by sulphurous acid or an acidulated solution of bisulphite.

HYRALDITE.

Hyraldite is a stable formaldehyde compound of hydrosulphite, and serves for discharging and also for stripping.

It is marketed in the following brands:

Hyraldite A
Hyraldite C extra
Hyraldite C special
Hyraldite W
Hyraldite CW extra
Hyraldite Z for Stripping.

Hyraldite A, C extra and special are easily soluble in water; the "W" brands are partially soluble. Hyraldite Z for Stripping is insoluble in water and keeps exceedingly well. Hyraldite should be kept in a cool place in closed vessels.

Hyraldite A and the double strength brand *Hyraldite C extra* serve for discharging and also for stripping. *Hyraldite Z for Stripping* is used especially for stripping; the other brands are used for discharging purposes only.

For particulars about *discharging* see volume IV.

The stripping is best done in wooden vessels, as iron and copper are very apt to cause spots on the goods. It is well to remove any metal steam-coils before entering the goods or to wrap them round with cotton cloth. Prepare a bath at 40—50° C. (105—120° F.), to which add

2 — 4 %	Hyraldite Z for Stripping	} of the weight of the goods
2.5— 5.5 %	formic acid 85% or	
1 — 2 %	sulphuric acid	
or		
5 —10 %	Hyraldite A or	} of the weight of the goods;
2.5— 5 %	Hyraldite C extra with	
5 —10 %	acetic acid 8½° Tw. or sodium bisulphite 64° Tw.	

enter the goods, raise gradually to the boil in the course of ½ to ¾ hour, and boil for 20 to 30 minutes. Hereafter rinse well, neutralise if necessary, and rinse once more.

SOAP.

Soaps are usually classed as hard or soda soaps, and soft or potash soaps. The latter practically all contain impurities from the raw materials, for instance excess alkali and glycerine, and are therefore only used where these impurities cannot have any injurious effect and where the unpleasant smell they leave on the goods does not signify.

Hard soaps are purified soaps, frequently but very imperfectly freed from excess alkali and glycerine.

In cotton dyeing, so-called olive-oil soap prepared from olive-oil and caustic soda-lye as a rule is used, which has to be free from any excess of alkali, glycerine or odorous fats. It is employed principally when the goods need not be rinsed after dyeing and are expected to be free from any smell.

Generally, however, other good qualities of soap may also be used. Frequently the soaps are prepared by boiling oleïne (crude oleïc acid), with soda lye according to the following recipe:

30 lbs	oleïne
12 lbs	caustic soda lye of 70° Tw.
16 gallons	water.

The lye is boiled up with one-half of the water, and the oleïne is added gradually with continuous stirring. When no lumps of soap are left, the other half of the water is added, stirring being continued for at least another hour. Prolonged boiling is essential in order that the oleïne and the lye may combine completely.

A good hard soap must possess the following properties: It must contain a high percentage of soap proper, i. e. alkali salts of fatty acids, and be free or not contain too much unsaponified fat, alkali, common salt, glycerine and other impurities such as silicate of potash, starch, clay, etc. No hard and fast rules can however be given regarding the composition of the soaps, which is very variable. Generally, good qualities of soap should contain approximately:

60—70%	fatty acid
6—8%	alkali, calculated as caustic soda
20—30%	water.

An exact evaluation of the soap can be carried out by chemical analysis only. In order to determine approximately the quantity of the free alkali, 10 grms. of the soap are dissolved in hot, pure alcohol, filtered, and tested with phenol phtaleïne solution. If the solution turns red, this indicates the presence of free caustic alkali, although slight quantities are not enough to produce a red colouration. The solution may be titrated with acid to determine the amount of free alkali present. Any soda present will remain on the filter, likewise most of the adulterations that come into consideration.

TURKEY-RED OIL.

Turkey-red oil is prepared by treating castor-oil with sulphuric acid, and is marketed in the form of an oily liquid easily soluble in water charged with caustic soda lye or ammonia. It contains approximately 50—65% of Turkey-red oil. A good quality should contain at least 50% Turkey-red oil. It is used for various purposes in dyeing, amongst others for the levelling of Diamine and Immedial Colours on mercerised cotton. As compared with soap, which is likewise used frequently for this purpose, it has the advantage of being less apt to form precipitates in calcareous water.

UNIVERSAL OIL. AVIROL. MONOSOLVOL.

Under these and other denominations, various preparations soluble in water are marketed in a liquid or solid form, which are all in character similar to Turkey-red oil; they are distinguished especially by their property of being but slightly sensitive to lime, and in this respect superior to Turkey-red oil. They are less apt to form precipitates with lime and magnesia salts, and have the property to re-dissolve lime or magnesia soaps that may have formed. These products are not decomposed by the quantities of common salt or acids customary in dyeing and finishing. Owing to these properties they are used extensively and in large quantities for dyeing and finishing, as substitutes for Turkey-red oil.

CASTOR-OIL SOAP.

Castor-oil soap is a preparation similar to Turkey-red oil and is to be preferred to the latter in dyeing Paranitraniline Red owing to its property to yield a

finer red. It is sold by the Turkey-red oil manufacturers in a very good quality, but may be prepared according to the following recipe:

- 10 lbs castor-oil, first quality (obtained from the first pressing) are stirred well with
- 8½ lbs caustic soda lye of 36° Tw., and boiled for 1 hour; after about 5 hours when the soap has cooled off to some extent,
- 2½ lbs hydrochloric acid of 32° Tw. are added, the mixture is then boiled for another ½ hour, and the solution of common salt poured off.

TANNINS.

This group comprises a number of organic acids derived from the vegetable kingdom, which are all similar in their chemical character, and are distinguished in general by their properties to convert the skins of animals into leather, to precipitate albumen and glue, alkaloids and Basic Colours from their solutions, and together with ferric acetate to yield blue-black or dark green precipitates; other distinguishing features are their strong astringent taste and their feebly acid reactions towards litmus as also their strong reducing power.

In the dye-house the tannins are principally used on account of their property to yield insoluble compounds with certain metallic oxides and dyestuffs as mordants and weighting agents. (Cutch and Gambier also belong to the group of tannins.)

The tannins are usually coloured to some extent and consequently impart a brownish yellow or brownish tone to the goods treated with them. For the production of light and brilliant shades, tannic acid is therefore used principally, which is the purest and the least coloured of the tannins, as also decoctions of gall-nuts and decoloured sumac extract, whereas for deeper shades leaf-sumach, ordinary sumac extracts, myrobalans, knopperrn, valonias, etc. are given the preference as being cheaper.

The tannins which are most important in the dye-house are the following:

1. *Tannic Acid*, or *Gallo-Tannic Acid*. Tannic acid is found in many parts of plants holding tannin, particularly in gall-nuts and in the pure sumac (from *Rhus coriaria*),

and is obtained principally from the gall-nuts in Eastern Asia, which are very rich in tannic acid.

It is marketed in the form of a light-coloured powder or of yellowish to brownish scales, or again as a brittle glassy substance of the same colouration, or as a foamy mass. When exposed to the air, it gradually becomes darker. It dissolves in 6 times its weight of cold water, and more easily so in hot water; in dilute alcohol, dilute acetic acid or glycerine it dissolves very freely. The aqueous solution decomposes gradually when left standing. Alkaline solutions become strongly discoloured.

The better kinds of commercial tannic acid contain about 65—85% tannin; the well-known brand of foamy tannic acid is well-nigh chemically pure. Good tannic acid yields a clear solution in water or in alcohol containing water, and on being reduced to ashes leaves but little residue. There are however very efficient qualities on the market which do not yield a perfectly clear solution in water. Pure gallo-tannic acid yields a clear solution in a mixture of equal parts of alcohol and ether, while most of the impurities and adulterations — gallic acid excepted — are not dissolved thereby.

2. *Gall-nuts* or *Galls* are ball-shaped abnormal growths caused by the sting of insects when depositing their eggs; they should be collected before they have been pierced by the young insect. Of the oak gall-nuts, the green or black Aleppo and Levante gall-nuts are the best, which contain about 55—60% gallo-tannic acid. The Hungarian, Italian, French and German gall-nuts are very much poorer in tannic acid. The Chinese and Japanese galls contain up to about 80% gallo-tannic acid, and are used principally for the manufacture of pure tannic acid.

3. *Knoppern* are gall-nuts from an oak growing in Austria which contain only 25—35% gallo-tannic acid, and are not much used in the dye-house.

4. *Sumac*. Next to pure tannic acid, is the tannin most generally used in cotton dyeing. The sumac from *Rhus coriaria* is the best, and contains gallo-tannic acid. The finest quality, and at the same time the least coloured, is the Sicilian sumac; next to it comes American sumac, which has gained greatly in quality during the last years, as well as the Greek, Spanish and Portuguese sumac. Of less value are the sumacs from *coriaria myrtifolia* and

rhus cotinus obtained in Hungary, the Tyrol and the Provence.

Commercial sumac usually consists of the whole, broken-up, or sometimes also powdered leaves of the plant; the stalks of the leaves are very often mixed up with the rest. The good kinds have an olive-green colour and a fresh agreeable, smell; they contain 15—20%, even sometimes more than 20% tannin. Sumacs, which are dull in colour and have a musty smell, have deteriorated by moisture and too long storing. Sumac is used principally as a tannin for dark shades; the dull-red colour which the sumac contains usually interferes rather with light and brilliant shades.

Sumac extract is sold as a thick dark-brown liquid of about 52° Tw. or in a solid state. Decolorised sumac extracts may as a rule replace the tannic acid, even for bright shades.

Liquid sumac extract is rather apt to ferment, losing thereby in strength.

5. *Myrabolans* are the fruit of various Chinese and East Indian plants which are marketed in a dry state and ground down to powder. They contain about 25—45% ellagitannic acid and also a yellow-brown dyestuff. In cotton dyeing it is sometimes used for dyeing the warp black in half-wool pieces, and for covering noils.

6. *Valonias* are the acorn cups of certain species of oak growing on the Mediterranean coast which contain 25—35% tannin, probably gallo-tannic acid, as well as a dirty-coloured yellow dyestuff. They are sometimes employed similarly to myrabolans.

7. *Divi-Divi* or *Libi-Divi* are the pods of certain plants growing in Central and South America which contain about 19—35% ellagitannic acid and are used in the same way as myrabolans.

The above tannins, as also several others, are used largely for dyeing cotton and for weighting silk, more particularly black silk.

The *value of the tannins* varies a good deal according to the amount of tannic acid they contain; it is immaterial in estimating their value whether they contain gallo-tannic or ellagitannic acid. For many purposes the amount of dirty dyestuff contained in the tannins is likewise a consideration. When stored for a long time, principally in damp, close places, the tannins are deteriorated through the decomposition of the tannic acid.

The value of the tannins is best determined by an exact titration with permanganate and by making dye-tests.

For *testing by dyeing*, dissolve carefully weighed quantities of the tannin to be tested and of that with which it is to be compared (of pure tannic acid about 0.3 grm.) in hot water. Fill up with water up to 250 cc. add 10 grms. common salt and $2\frac{1}{2}$ cc. glacial acetic acid (or about 5 cc. good acetic acid) in each vessel, and mordant therein 10 grms. of cotton yarn, previously well boiled, for 3 hours, the liquid meanwhile being allowed to cool off; then wring off each hank by itself, without however rinsing, and turn them in a glass containing 200 cc. nitrate of pyrolignite of iron of $1\frac{1}{2}$ —3° Tw. for 15 to 20 minutes, rinse and dry; the strength of the tannin is then determined from the depth of the shade of the cotton.

In order to determine how the material is suited for light shades, fix it with antimony instead of iron salts, and dye with Basic Colours, for instance New Methylene Blue GG or Irisamine G; it will then be found that one tannin is sometimes more suited for blue, and another more for red shades.

THERMOMETER TABLES.

COMPARISON OF THE THERMOMETER TABLES OF CELSIUS (CENTIGRADES), FAHRENHEIT AND REAUMUR.

Degrees			Degrees			Degrees		
Celsius	Fahren- heit	Réau- mur	Celsius	Fahren- heit	Réau- mur	Celsius	Fahren- heit	Réau- mur
0	32.0	0.0	34	93.2	27.2	68	154.4	54.4
1	33.8	0.8	35	95.0	28.0	69	156.2	55.2
2	35.6	1.6	36	96.8	28.8	70	158.0	56.0
3	37.4	2.4	37	98.6	29.6	71	159.8	56.8
4	39.2	3.2	38	100.4	30.4	72	161.6	57.6
5	41.0	4.0	39	102.2	31.2	73	163.4	58.4
6	42.8	4.8	40	104.0	32.0	74	165.2	59.2
7	44.6	5.6	41	105.8	32.8	75	167.0	60.0
8	46.4	6.4	42	107.6	33.6	76	168.8	60.8
9	48.2	7.2	43	109.4	34.4	77	170.6	61.6
10	50.0	8.0	44	111.2	35.2	78	172.4	62.4
11	51.8	8.8	45	113.0	36.0	79	174.2	63.2
12	53.6	9.6	46	114.8	36.8	80	176.0	64.0
13	55.4	10.4	47	116.6	37.6	81	177.8	64.8
14	57.2	11.2	48	118.4	38.4	82	179.6	65.6
15	59.0	12.0	49	120.2	39.2	83	181.4	66.4
16	60.8	12.8	50	122.0	40.0	84	183.2	67.2
17	62.6	13.6	51	123.8	40.8	85	185.0	68.0
18	64.4	14.4	52	125.6	41.6	86	186.8	68.8
19	66.2	15.2	53	127.4	42.4	87	188.6	69.6
20	68.0	16.0	54	129.2	43.2	88	190.4	70.4
21	69.8	16.8	55	131.0	44.0	89	192.2	71.2
22	71.6	17.6	56	132.8	44.8	90	194.0	72.0
23	73.4	18.4	57	134.6	45.6	91	195.8	72.8
24	75.2	19.2	58	136.4	46.4	92	197.6	73.6
25	77.0	20.0	59	138.2	47.2	93	199.4	74.4
26	78.8	20.8	60	140.0	48.0	94	201.2	75.2
27	80.6	21.6	61	141.8	48.8	95	203.0	76.0
28	82.4	22.4	62	143.6	49.6	96	204.8	76.8
29	84.2	23.2	63	145.4	50.4	97	206.6	77.6
30	86.0	24.0	64	147.2	51.2	98	208.4	78.4
31	87.8	24.8	65	149.0	52.0	99	210.2	79.2
32	89.6	25.6	66	150.8	52.8	100	212.0	80.0
33	91.4	26.4	67	152.6	53.6			

HYDROMETER TABLES.

COMPARISON OF HYDROMETER DEGREES TWADDLE AND BAUME WITH THE SPECIFIC GRAVITIES FOR LIQUIDS HEAVIER THAN WATER.

Degrees Twaddle	De- grees Baumé	Spec. Gravity	Degrees Twaddle	De- grees Baumé	Spec. Gravity	Degrees Twaddle	De- grees Baumé	Spec. Gravity
1	0.7	1.005	58	32.4	1.290	116	53.0	1.580
2	1.4	1.010	60	33.3	1.300	118	53.6	1.590
4	2.7	1.020	62	34.2	1.310	120	54.1	1.600
6	4.1	1.030	64	35.0	1.320	122	54.7	1.610
8	5.4	1.040	66	35.8	1.330	124	55.2	1.620
10	6.7	1.050	68	36.6	1.340	126	55.8	1.630
12	8.0	1.060	70	37.4	1.350	128	56.3	1.640
14	9.4	1.070	72	38.2	1.360	130	56.9	1.650
16	10.6	1.080	74	39.0	1.370	132	57.4	1.660
18	11.9	1.090	76	39.8	1.380	134	57.9	1.670
20	13.0	1.100	78	40.5	1.390	136	58.4	1.680
22	14.2	1.110	80	41.2	1.400	138	58.9	1.690
24	15.4	1.120	82	42.0	1.410	140	59.5	1.700
26	16.5	1.130	84	42.7	1.420	142	59.9	1.710
28	17.7	1.140	86	43.4	1.430	144	60.4	1.720
30	18.8	1.150	88	44.1	1.440	146	60.9	1.730
32	19.8	1.160	90	44.8	1.450	148	61.4	1.740
34	20.9	1.170	92	45.4	1.460	150	61.8	1.750
36	22.0	1.180	94	46.1	1.470	152	62.3	1.760
38	23.0	1.190	96	46.8	1.480	154	62.8	1.770
40	24.0	1.200	98	47.4	1.490	156	63.2	1.780
42	25.0	1.210	100	48.1	1.500	158	63.7	1.790
44	26.0	1.220	102	48.7	1.510	160	64.2	1.800
46	26.9	1.230	104	49.4	1.520	162	64.6	1.810
48	27.9	1.240	106	50.0	1.530	164	65.0	1.820
50	28.8	1.250	108	50.6	1.540	166	65.5	1.830
52	29.7	1.260	110	51.2	1.550	168	65.9	1.840
54	30.6	1.270	112	51.8	1.560	169	66.1	1.845
56	31.5	1.280	114	52.4	1.570	170	66.3	1.850

Note:

The degrees in Twaddle's hydrometer bear a direct relationship to the specific gravity and may be obtained from the same by the following formula in which d represents the specific gravity and n the number of degrees Twaddle: $n = \frac{1000 d - 1000}{5}$. On the other hand by

the formula $d = \frac{5 n + 1000}{1000}$ the degrees Twaddle are converted into the corresponding specific gravity. For values below 2.0 the degrees Twaddle may also be obtained from the specific gravity by moving the decimal point two figures to the right, striking off the first figure and multiplying the rest by 2, as per the following example:

Specific gravity 1.133:
 113.3:
 13.3 $\times 2$:
 26.6° Twaddle.

COMPARISON OF HYDROMETER DEGREES BAUMÉ WITH THE SPECIFIC GRAVITY OF LIQUIDS LIGHTER THAN WATER.

Degrees Baumé	Spec. Gravity	Degrees Baumé	Spec. Gravity	Degrees Baumé	Spec. Gravity	Degrees Baumé	Spec. Gravity
11	0.993	16	0.960	21	0.930	26	0.901
12	0.987	17	0.954	22	0.924	27	0.896
13	0.980	18	0.948	23	0.918	28	0.890
14	0.973	19	0.942	24	0.913	29	0.885
15	0.967	20	0.936	25	0.907	30	0.880

WEIGHTS AND MEASURES.

I. METRIC SYSTEM.

- 1 metre (m) = 10 decimetres (dm) = 100 centimetres (cm) = 1000 millimetres (mm).
 1 litre (l) = 1000 cubic centimetres (c.c. or ccm). 1 cubic metre (cbm) = 1000 litres.
 1 gramme (g or gr or grm) = 10 decigrammes (dg) = 100 centigrammes (cg) = 1000 milligrammes (mg).
 1 kilogramme (kg or kilo) = 1000 grammes.
 1000 kilogrammes = 1 ton (t) i. e. metric ton.
 100 kilogrammes = 1 metric centner or quintal.
 50 kilogrammes = 1 centner (or nearly 1 hundredweight).
 10 grammes = 1 dekagramme (deka or dg). 100 grammes = 1 hectogramme (hg).

The gramme is the standard unit of weight of the metric system, and is equal to the weight of 1 cubic centimetre of pure water (measured whilst at its greatest density, in vacuum under a latitude of 45 degrees, at sea level). Hence the following relations of weights and measures are obtained:

- 1 cubic centimetre water = 1 gramme.
 1 litre " = 1 kilogramme.
 1 cubic metre " = 1 ton.

II. ENGLISH WEIGHTS AND MEASURES.

- 1 yard (yd) = 3 feet. 1 foot (') = 12 inches ("). 1 inch = 12 lines (""').
 1 yard = 91.44 centimetres. 1 foot = 30.48 centimetres. 1 inch = 2.54 centimetres.
 1 metre = 1.094 yard = 3.281 feet = 39.37 inches.
 1 Imperial gallon (gall.) = 4 quarts (qts) = 8 pints (pts) = 32 gills.
 1 Imperial gallon = 4.544 litres. 1 litre = 0.220 Imperial gallon.
 1 pint = 0.568 litre. 1 litre = 1.76 pints.

In England by the term gallon (gall.) the Imperial gallon is meant, whilst in the United States of America the considerably smaller apothecary's or wine gallon is usually understood by this term. In England the ton or gross ton of 2240 lbs is also exclusively in use, whilst in the United States the term "ton" may refer either to the gross ton of 2240 lbs or the short ton of 2000 lbs avoirdupois. The weights and measures used in this book always refer to the Imperial gallon, and to the gross ton of 2240 lbs.

- 1 wine gallon = 4 quarts = 8 pints.
 1 wine gallon = 3.785 litres. 1 litre = 0.264 wine gallon.
 1 pint (apothecary's measure) = 0.473 litre. 1 litre = 2.114 pints (apothecary's measure).
 1 Imperial gallon = 1.2 wine gallon. 1 wine gallon = 0.8335 Imperial gallon.
 1 pound avoirdupois (lb) = 16 ounces (oz) = 256 drachms (drm.)
 1 pound avoirdupois = 7000 Troy grains (gr).
 1 ton (gross ton) = 20 hundredweights (cwt) = 2240 lbs.
 1 hundredweight = 4 quarters (28 lbs each) = 112 lbs.
 1 ton = 1016 kilogrammes. 1 pound avoirdupois = 453.593 grammes.
 1 ounce = 28.349 grammes. 1 Troy grain = 0.065 gramme.
 1 kilogramme = 2.205 lbs avoirdupois. 1 gramme = 15.434 Troy grains.
 1 Imperial gallon holds 10 pounds avoirdupois or 70 000 grains water (measured at 62° F. under a barometric pressure of 30 inches).
 1 wine gallon holds only 8.35 lbs water.

III. RUSSIAN WEIGHTS AND MEASURES.

- 1 sagèn = 3 arshin = 7 feet.
 1 foot = 12 inches. 1 arshin = 16 vershock.
 1 foot = 30.48 centimetres. 1 inch = 2.54 centimetres. 1 Russian foot or inch equal to 1 English foot or inch respectively.
 1 arshin = 71.12 centimetres. 1 vershock = 4.45 centimetres.
 1 metre = 3.28 feet = 39.37 inches = 1.41 arshin = 22.50 vershock.
 1 vedro = 8 stof = 12 quart = 30 krushkl.
 1 vedro = 12.30 litres. 1 stof = 1.54 litre. 1 quart = 1.02 litre.
 1 litre = 0.0813 vedro = 0.9756 quart.
 1 pood = 40 pound (Russian). 1 pound = 32 lot = 96 solotnik.
 1 pood = 16.38 kilogrammes. 1 kilogramme = 0.06 pood.
 1 pound (Russian) = 409.51 grammes. 1 lot = 12.48 grammes. 1 solotnik = 4.16 grammes.
 1 killogramme = 2.44 pounds (Russian).

In Russian Poland the following weights and measures are used:

- 1 ell = 2 feet = 0.81 arshin = 12.96 vershock.
 1 foot = 12 inches = 0.945 Russian foot = 11.34 Russian inches.
 1 ell = 57.6 centimetres. 1 foot = 28.8 centimetres.
 1 pound = 32 lots = 0.99 Russian pound = 405.50 grammes.
 1 centner = 4 stone = 100 pounds = 2.476 pud.

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PERCENTAGE TABLES.

PERCENTAGE TABLES

This table provides the practical dyer with a convenient and exact method of converting percentages of colour into avoirdupois.

The following may serve as an example:

If 60 lbs of material are to be dyed with 1.69⁰/₀ of colour, proceed as follows:

For 10 lbs,	1 ⁰ / ₀ equals	1 oz 263 grains	
“ 50 “	1 ⁰ / ₀ “	8 oz	
For 60 lbs,	1 ⁰ / ₀ equals	9 oz 263 grains	9 oz 263 grains
For 10 lbs,	0.69 ⁰ / ₀ equals	1 oz 46 grains	
“ 50 “	0.69 ⁰ / ₀ “	5 oz 228 grains	
For 60 lbs,	0.69 ⁰ / ₀ equals	6 oz 274 grains	6 oz 274 grains
	<u>1.69⁰/₀</u>		<u>15 oz 537 grains</u>
			or 1 lb 99 grains

PERCENTAGE TABLES.

Per Cent	For 10 Lbs	For 50 Lbs	For 100 Lbs
10 %	1 lb.	5 lbs.	10 lbs.
9 %	14 oz. 175 grains	4 1/2 lbs.	9 lbs.
8 %	12 oz. 350 grains	4 lbs.	8 lbs.
7 %	11 oz. 87 grains	3 1/2 lbs.	7 lbs.
6 %	9 oz. 263 grains	3 lbs.	6 lbs.
5 %	8 oz.	2 1/2 lbs.	5 lbs.
4 %	6 oz. 175 grains	2 lbs.	4 lbs.
3 %	4 oz. 350 grains	1 1/2 lbs.	3 lbs.
2 %	3 oz. 83 grains	1 lb.	2 lbs.
1 %	1 oz. 263 grains	8 oz.	1 lb.
0.99	1 oz. 256 grains	7 oz. 403 grains	15 oz. 368 grains
0.98	1 oz. 249 grains	7 oz. 368 grains	15 oz. 238 grains
0.97	1 oz. 242 grains	7 oz. 333 grains	15 oz. 228 grains
0.96	1 oz. 235 grains	7 oz. 298 grains	15 oz. 158 grains
0.95	1 oz. 228 grains	7 oz. 263 grains	15 oz. 88 grains
0.94	1 oz. 221 grains	7 oz. 228 grains	15 oz. 18 grains
0.93	1 oz. 214 grains	7 oz. 193 grains	14 oz. 385 grains
0.92	1 oz. 207 grains	7 oz. 158 grains	14 oz. 315 grains
0.91	1 oz. 200 grains	7 oz. 123 grains	14 oz. 245 grains
0.90	1 oz. 193 grains	7 oz. 88 grains	14 oz. 175 grains
0.89	1 oz. 186 grains	7 oz. 53 grains	14 oz. 105 grains
0.88	1 oz. 179 grains	7 oz. 18 grains	14 oz. 35 grains
0.87	1 oz. 172 grains	6 oz. 430 grains	13 oz. 403 grains
0.86	1 oz. 165 grains	6 oz. 385 grains	13 oz. 333 grains
0.85	1 oz. 158 grains	6 oz. 350 grains	13 oz. 263 grains
0.84	1 oz. 151 grains	6 oz. 315 grains	13 oz. 193 grains
0.83	1 oz. 144 grains	6 oz. 280 grains	13 oz. 123 grains
0.82	1 oz. 137 grains	6 oz. 245 grains	13 oz. 53 grains
0.81	1 oz. 130 grains	6 oz. 210 grains	12 oz. 420 grains
0.80	1 oz. 123 grains	6 oz. 175 grains	12 oz. 350 grains
0.79	1 oz. 116 grains	6 oz. 140 grains	12 oz. 280 grains
0.78	1 oz. 109 grains	6 oz. 105 grains	12 oz. 210 grains
0.77	1 oz. 102 grains	6 oz. 70 grains	12 oz. 140 grains
0.76	1 oz. 95 grains	6 oz. 35 grains	12 oz. 70 grains
0.75	1 oz. 88 grains	6 oz.	12 oz.
0.74	1 oz. 81 grains	5 oz. 403 grains	11 oz. 368 grains
0.73	1 oz. 74 grains	5 oz. 368 grains	11 oz. 298 grains
0.72	1 oz. 67 grains	5 oz. 333 grains	11 oz. 228 grains
0.71	1 oz. 60 grains	5 oz. 298 grains	11 oz. 158 grains
0.70	1 oz. 53 grains	5 oz. 263 grains	11 oz. 88 grains

PERCENTAGE TABLES.

Per Cent	For 10 Lbs	For 50 Lbs	For 100 Lbs
0.69	1 oz. 46 grains	5 oz. 228 grains	11 oz. 18 grains
0.68	1 oz. 39 grains	5 oz. 193 grains	10 oz. 385 grains
0.67	1 oz. 32 grains	5 oz. 158 grains	10 oz. 315 grains
0.66	1 oz. 25 grains	5 oz. 123 grains	10 oz. 245 grains
0.65	1 oz. 18 grains	5 oz. 88 grains	10 oz. 175 grains
0.64	1 oz. 11 grains	5 oz. 53 grains	10 oz. 105 grains
0.63	1 oz. 4 grains	5 oz. 18 grains	10 oz. 35 grains
0.62	434 grains	4 oz. 420 grains	9 oz. 403 grains
0.61	427 grains	4 oz. 385 grains	9 oz. 333 grains
0.60	420 grains	4 oz. 350 grains	9 oz. 263 grains
0.59	413 grains	4 oz. 315 grains	9 oz. 193 grains
0.58	406 grains	4 oz. 280 grains	9 oz. 123 grains
0.57	399 grains	4 oz. 245 grains	9 oz. 53 grains
0.56	392 grains	4 oz. 210 grains	8 oz. 420 grains
0.55	385 grains	4 oz. 175 grains	8 oz. 350 grains
0.54	378 grains	4 oz. 140 grains	8 oz. 280 grains
0.53	371 grains	4 oz. 105 grains	8 oz. 210 grains
0.52	364 grains	4 oz. 70 grains	8 oz. 140 grains
0.51	357 grains	4 oz. 35 grains	8 oz. 70 grains
0.50	350 grains	4 oz.	8 oz.
0.49	343 grains	3 oz. 403 grains	7 oz. 368 grains
0.48	336 grains	3 oz. 368 grains	7 oz. 298 grains
0.47	329 grains	3 oz. 333 grains	7 oz. 228 grains
0.46	322 grains	3 oz. 298 grains	7 oz. 158 grains
0.45	315 grains	3 oz. 263 grains	7 oz. 88 grains
0.44	308 grains	3 oz. 228 grains	7 oz. 18 grains
0.43	301 grains	3 oz. 193 grains	6 oz. 385 grains
0.42	294 grains	3 oz. 158 grains	6 oz. 315 grains
0.41	287 grains	3 oz. 123 grains	6 oz. 245 grains
0.40	280 grains	3 oz. 88 grains	6 oz. 175 grains
0.39	273 grains	3 oz. 53 grains	6 oz. 105 grains
0.38	266 grains	3 oz. 18 grains	6 oz. 35 grains
0.37	259 grains	2 oz. 420 grains	5 oz. 403 grains
0.36	252 grains	2 oz. 385 grains	5 oz. 333 grains
0.35	245 grains	2 oz. 350 grains	5 oz. 263 grains
0.34	238 grains	2 oz. 315 grains	5 oz. 193 grains
0.33	231 grains	2 oz. 280 grains	5 oz. 123 grains
0.32	224 grains	2 oz. 245 grains	5 oz. 53 grains
0.31	217 grains	2 oz. 210 grains	4 oz. 420 grains
0.30	210 grains	2 oz. 175 grains	4 oz. 350 grains

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